PROCEEDINGS

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OF

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1882.

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JOSEPH LEIDY, M. D., GEO. H. HORN, M. D.,
EDWARD J. NOLAN, M. D., THOMAS MEEHAN,
JOHN H. REDFIELD.

EDITOR: EDWARD J. NOLAN, M. D.

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EDWARD J. NOLAN,
Recording Secretary.

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LIST OF CONTRIBUTORS.

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PROCEEDINGS

OF THE

ACADEMY OF NATURAL SCIENCES

OF

PHILADELPHIA.

1882.

JANUARY 3, 1882.

The President, Dr. Jos. LEIDY, in the chair.

Twenty-six persons present.

Fruiting of Ginko biloba.—Mr. THOMAS MEEHAN referred to some specimens of this plant (*Salisburia adiantifolia* of Smith and other authors subsequent to Linnæus) which had been borne by a tree on the grounds of Mr. Chas. J. Wister, of Germantown. The tree was far removed from any other flowering tree, which afforded good grounds for the belief that this specimen was hermaphrodite. In botanical classification the genus was accepted as of diœcious character. Sexual characters were, however, among the most unreliable. There would be nothing improbable in a tree bearing wholly male or wholly female flowers as a general rule, changing so far as to have both on one tree. Cases of this kind were not uncommon in *Acer dasycarpum*, and other deciduous trees, and, he believed, probable in the red cedar, *Juniperus virginiana*, an ally of the *Ginko*. In this cedar there were often trees met with which were wholly male in most seasons, but on which occasional berries might be seen; while other trees, usually so abundantly fertile as to be almost covered with blue berries, would occasionally have many more male flowers than usual. In Rubiaceous plants, where dimorphic flowers were so common—the short-styled ones and the short-stamened ones being on distinct plants, and practically diœcious—there were cases of change at times. The white-berried *Mitchella repens* which were growing on his grounds, apart from the red-berried variety, had not produced a

[illegible] re produced; and the short- [illegible] greenhouses, and with short [illegible] plant under his observation [illegible] projecting beyond the corolla. [illegible] ual characters was well known [illegible] s. *Ambrosia artemisiæfolia,* [illegible] tly male flowers in poor soil, [illegible] wheat fields after the grain [illegible] her soil of potato or Indian- [illegible] e flowers is very marked. [illegible] nditions are found wholly [illegible] ugh some innate law. Male [illegible] spikes which bear the grain, [illegible] ssels," showed the occasional [illegible] It is more than likely that [illegible] e Asiatic coniferæ, does not

[illegible] hat fruit had been found on [illegible] rk, New York; and that bees [illegible] s, and fertilize female flowers. [illegible] ce of fruit on isolated trees

[illegible] en from the large male tree, [illegible] the old Hamilton homestead, [illegible] six miles away in a direct line, [illegible] ister's tree in Germantown. [illegible], remarked that pollen from [illegible] arried by winds to enormous

[illegible] *ns.*—Prof. Leidy remarked in [illegible] esented by him this evening, [illegible] ted last summer on South [illegible] sville, Berks Co., Pa. The [illegible] ainly compact gneiss, often [illegible] ot folded or contorted. With [illegible] or no mica, and black syenite [illegible] h feldspar and quartz in fine [illegible] of the vicinity are traversed [illegible] sdam sandstone flanks the [illegible] this at the base is overlaid by [illegible] the Lebanon Valley. The [illegible] s of the Potsdam sandstone [illegible] their sharply defined character, [illegible] ragments of orthoclase. The [illegible] rhomboidal, usually in two [illegible] ratification, but also frequently [illegible] lly the jointing presents other

planes; thus one of the specimens, the size of an ordinary brick exhibits planes due to jointing in five different directions.

Incidentally to the foregoing, Prof. Leidy said that it would be an interesting subject of investigation to trace the source of the materials of the gravel on which our city is built. Everywhere of a red color due to the peroxidizing of the iron of the rocks from which the gravel has been derived, the basis of this latter is mainly siliceous. Many of the siliceous pebbles, from a small size to boulders approximating a ton in weight, appear to have been derived from the Potsdam sandstone, north of the city. They commonly have the same quartzite constitution; and in their irregularly rectangular and rhomboidal form, with borders and angles rounded by attrition, they exhibit the jointed condition of the Potsdam rocks. In earlier days when he learned that quartz belonged to the rhomboidal system, but exhibited no disposition to cleavage, he thought that the rhomboidal quartz pebbles of our gravel were examples showing a tendency to crystalline cleavage. Some of the quartzite pebbles, like portions of the Potsdam rocks, are of so compact a character, and banded in structure, that when polished they look like chalcedony, as exemplified by a specimen picked up on the Delaware shore.

Other pebbles of milky, smoky, and other quartz appear to have been derived from quartz veins of our neighboring gneiss rocks.

Black pebbles found in the gravel used in the construction of the bed of the junction railroad just north of the city, and collected as specimens of basanite or touchstone, appear to be hornstone or chert, like that in the lower Silurian limestone at Easton. Numerous pebbles of the same kind are found on the Delaware shore at the latter place. Limestone itself appears to form no conspicuous element of our gravels. Though abundant in the same sources of supply of the common ingredients of the gravels, its fragments have been completely dissolved away. Occasionally he had seen in the interior of a freshly broken pebble of black hornstone, such as one presented this evening, minute rhombohedrons of calcite, while on the exterior minute cavities of the same form show where similar crystals have been dissolved.

Pebbles of red sandstones and shales are frequent elements of our gravel, and have evidently been derived from the triassic rocks, so abundantly exhibited north of the city. Pebbles of compact quartz conglomerate are less frequent, and may probably have been derived from the same source, or perhaps from the coal measures farther north.

Irregular pebbles of various sizes, of a variety of granite, consisting of quartz with conspicuously large crystals of muscovite mica, occur in some localities, as in West Philadelphia, but a similar rock in place is unknown to him. The exposed sides of the mica crystals, worn into hollows of the quartz, appear so compact,

that one would hardly suspect their character without seeing the cleavage surfaces.

Fossils of any kind are extremely rare in the gravel of our immediate vicinity, and in the course of a lifetime he had picked up less than half a dozen quartzose pebbles pseudomorphic of a coral like *Favosites*, and with some obscure brachiopod impressions.

In the locality, from which the jointed specimens of quartzite of the Potsdam sandstone presented this evening were collected, he looked in vain for *Scolithus linearis*, viewed as a characteristic fossil of this formation. Some miles further off, near Sheridan Station, where an exposure of the same rock was less metamorphosed, and in part consisted of friable sand, he picked up a single specimen which contained the fossil.

JANUARY 10, 1882.

The President, Dr. LEIDY, in the chair.

Twenty-six persons present.

Three more Fresh-water Sponges.—Mr. EDW. POTTS had described in the Proceedings under date of July 26, 1881, a new species of *Carterella*, *C. latitenta;* his later identified findings during that year are here mentioned.

MEYENIA CRATERIFORMA. This sponge, first found during September, 1881, in the Brandywine, near Chadd's Ford, is of very delicate structure. Its framework of skeleton spicules is exceedingly meagre and slightly bound together, scarcely amounting to a system of meshes and polyhedral interspaces as in most other sponges; and as a consequence we find the numerous small white statospheres lying in recesses far larger than themselves, freely exposed to view from the upper or outer side of the sponge. This trait is only seen in the thinnest of encrusting sponges.

The skeleton spicules may be described as acerate, gradually sharp-pointed, sparsely and very minutely microspined. With these were mingled smaller and more slender forms, which may be an earlier stage of the same, or perhaps are dermal spicules; but beside these may be seen upon the undisturbed surface of the sponge two other forms—one, cylindrical, slender, with truncate ends—the other similar in all respects to the long birotulates which surround the statospheres. The last have most probably been misplaced from their normal position.

The birotulate spicules surrounding the statospheres, as compared with those of any other described sponges, and with the diameter of their own rotules, are relatively very long. The diameter of the completed statosphere is to that of the contained chitinous body, about as 10 to 7, and the diameter of the rotules, while per-

haps double that of the shaft, is only from one-fifth to one-seventh of their length. A number of long, sharp spines occur near each extremity of the shaft. These birotulates are disposed, as is usual, very regularly and densely upon the surface of the chitinous body; one end of each being thus supported, the other forming a second or outer coat or surface. One peculiarity, however, of their arrangement has suggested the specific name now given. In most other species the length of the foraminal tube is fixed, or approximately indicated, by the thickness of the spiculiferous coat, which closes up around and against it. In this, however, on account of the unusual length of the spicules and their necessary radial direction, a space is left about the foramen, in the centre of which the tubule appears as an elongated cone; the whole having the appearance of a volcanic crater. In mounted specimens, probably as a result of violence in making sections of the statoblasts, these spicules frequently deviate from a direct radial position and cross each other's lines in a curious manner. This sponge has also been found in the Schuylkill River and in some of its smaller branches.

HETEROMEYENIA RYDERII. This beautiful green sponge has, as yet, only been found in a branch of Cobb's Creek, a small stream whose waters reach the Delaware River below Philadelphia. It occupied the upper surface of large stones in the bed of the stream; some of the patches being four or five inches in diameter and about one-fourth of an inch thick. The surface is somewhat irregular, occasionally rising into rounded lobes. The efferent canals are deeply channeled in the upper surface of the sponge; five or six sometimes converging to a common orifice.

The skeleton spicules are stout, cylindrical, slightly curved, gradually sharp-pointed, conspicuously spined, excepting at the extremities; spines conical, sharp-pointed; when largest often curving forward or towards the adjacent ends of the spicules. As is generally the case with spined skeleton spicules, they are but slightly fasciculated; being mostly arranged in a simple series, single spicules meeting or diverging from other spicules, thus forming a delicate network, supporting the sponge flesh. With these are mingled a few, more slender, smooth spicules which may be immature, or the true dermal spicules of the sponge.

The statospheres are numerous, rather small, surrounded *first* by a series of birotulates, short, stout, the rotulæ about equal in diameter to the length of the shaft. The shafts are cylindrical or somewhat wider toward the rotules, having frequently one or more long spines near the centre. Margins of the rotulæ marked with an infinity of shallow cuts not amounting to notches.

The *second* series of birotulates, which, more than in either of the other species of this genus, marks this as a deviation from the familiar *Meyenia* type, are very different from the first. They are nearly double the length of the former, much fewer in number, rather regularly interspersed among them; the rotules are repre-

sented by six, eight or more short recurved hooks, at each end of the shaft, which is cylindrical and studded with numerous spines, equal in length to the hooked rays of the rotulæ, and curving like them from the extremities. This species is respectfully dedicated by the discoverer to his friend, Mr. John A. Ryder, in acknowledgment of much excellent advice, assistance and encouragement.

TUBELLA PENNSYLVANICA. The genus *Tubella*, as established by Mr. H. J. Carter, Feb. 1881, was represented by four species, three originally described by Dr. Bowerbank (as Spongillas), and one by Mr. Carter—all collected in the Amazon River, South America. It does not appear that any have been described from other localities. It was therefore with much pleasure and some surprise that while examining material collected at Lehigh Gap, Pa., in November last, Mr. Potts came upon undoubted specimens of the same genus. It differs from *Meyenia* in the fact that the rotulæ of the spicules surrounding the statospheres are of unequal diameters; the larger one being placed next the chitinous coat. This species, whose peculiarities do not tally with those of any of the four above mentioned, may be thus described:

Sponge minute, encrusting, thin; the skeleton spiculæ arranged in a simple series of single non-fasciculated spicules, in the interspaces of which the statospheres are abundant.

Skeleton spicules very variable in size and shape, but all entirely and coarsely spined; rounded or abruptly pointed at the extremities.

Dermal spicules absent or undetermined.

Statospheres, numerous, small; granular coating thin but extending to or somewhat beyond the outer ends of the birotulates. Length of the inequibirotulates about equal to the diameter of the larger disk, which is placed against the chitinous coat. Margin of larger disk generally entire, sub-circular; outer surface flat, table-like, the margin sometimes slightly incurved. This surface is not infrequently warped or twisted into an irregular outline. The outer disk, in the great majority of cases, is about one-fifth the diameter of the inner, but varies from, say, one-sixth to equality, which is, however, rarely observed. Its margin also appears to be generally entire, but it is undoubtedly sometimes divided into six or eight rays. The inner surface of the larger disk is also occasionally marked with rib-like rays and still more rarely the margin between the rays is wanting.

These, as before stated, are all the species whose novelty has been definitely determined; but amongst the large amount of material collected are doubtless others, belonging to the genera *Spongilla* and *Meyenia*, whose distinguishing peculiarities are less obvious, and where close study will be needed to define them.

JANUARY 17, 1882.

The President, Dr. LEIDY, in the chair.

Twenty-six persons present.

The following papers were presented for publication :

"New Crinoids from the Rocks of the Chemung Period of New York State," by Henry S. Williams, Ph. D.

"The Species of Odontomyia found in the United States," by Dr. L. T. Day.

"A New Station for Corema Conradii," by Aubrey H. Smith.

JANUARY 24, 1882.

The President, Dr. LEIDY, in the chair.

Twenty-four persons present.

The death of M. Jules Putzeys, a correspondent, was announced.

The thanks of the Academy were ordered to be forwarded to Mrs. S. J. Haldeman Haly, for the gift of a portrait in oil of the late Prof. S. S. Haldeman, by Waugh.

Notes on Monazite.—Prof. GEORGE A. KÖNIG announced the identification of *Monazite* from the mica mine at Amelia Court House, Va. It has occurred in several large masses, from fifteen to twenty pounds in weight. One in the collection of Mr. C. S. Bement exhibits two crystals, monoclinic combinations of $P\infty \,.\, \infty P \,.\, \infty P\infty$, with sides over 5 inches in length. Such gigantic masses of this rare mineral have not heretofore been reported. It occurs together with equally huge crystals of microlite, fine crystals of columbite, of manganese tantalite, amazonite, albite, apatite, smoky quartz, and beryl; of the last mineral a crystal was found, 25 inches in diameter and over 12 feet long. This monazite was supposed to be microlite or scheelite. Two varieties have been identified by the speaker; one possessing an amber or brown color (transparent finely blood-red), and giving a straw-colored powder like microlite. The other variety is gray, with honey-yellow color in thin splinters, and yields a greenish gray powder; of the former the specific gravity is 5.402 and 5.345; of the latter it is 5.138.

When finely pulverized and mixed with two to three parts of

concentrated sulphuric acid, the mineral is decomposed very quickly as soon as the temperature is brought to the boiling point of sulphuric acid. The mass becomes a dry paste and dissolves in water. The solution is turbid from a quantity of basic phosphates, varying between two and eighteen per cent., according to the excess of acid present.

The acid solution may be boiled without the forming of a precipitate; thorium is therefore not contained in the mineral. Two determinations of the phosphoric acid gave 25.82 and 26.3 per cent., one being by phosphomolybdic acid; the other in the usual manner, after precipitating the bases first by oxalic acid, and the filtrate by ammonic hydrate. Fluorine is not present.

The following is given as a preliminary result, pending the tedious separation of the oxides:

$(Ce, La, Dy, Y)_2 O_3$	= 73.82
$(Y, Fe, Ca)_2 O_3$	= 1.00
$P_2 O_5$	= 26.05
Volatile by ignition	= 0.45
	101.32

Supposing the oxides to be all cerous oxide, or in other words having the atomic weight of 92, the highest of the group, then the ratio obtains

$$P_2 O_5 : 3\, Ce O = 1 : 3.75,$$

which is not reconcilable with a normal phosphate.

The speaker suggests, therefore, the possible presence in the group of a metal with a much higher atomic weight than cerium. He is engaged at work with a large enough quantity of the oxides to decide this question in time.

JANUARY 31.

The President, Dr. LEIDY, in the chair.

Eighteen persons present.

Messrs. Wilson Mitchell, Chas. H. Hutchinson, Rev. W. G. Holland, Able F. Price, Alfred C. Harrison and Robt. B. Haines were elected members.

Dr. A. Baltzer, of Zurich, and Prof. Robt. Collett, of Christiania, were elected correspondents.

The following were ordered to be published:—

NEW CRINOIDS FROM THE ROCKS OF THE CHEMUNG PERIOD OF NEW YORK STATE.

BY HENRY S. WILLIAMS, PH. D.

Hitherto the rocks of the Chemung period have furnished only imperfect traces of crinoids. Joints of the stems are frequently met with, in some places in great numbers, but we find mention of only three crinoids in condition sufficiently perfect for specific identification.

Cyathocrinus ornatissimus was described by Professor Hall in 1843 (Geol. Rept. of 4th Dist. N. Y. State, p. 247), from the Portage group at Portland, shore of Lake Erie, N. Y., but the description and figures leave the generic and family relations of the species in doubt, and we find no mention of the name in the exhaustive "Revision of Palæocrinoidea," of Wachsmuth and Springer, 1879–1881.

Taxocrinus (*Forbesiocrinus*) *communis* Hall and Whitfield, is recognized in a specimen from the Chemung group at Forestville, Chautauqua Co., N. Y. (see Palæontology of Ohio, vol. ii, p. 170). The original locality for the species is the shales of the Waverly sandstone of Richfield, Summit Co., Ohio.

A third species, *Platycrinus Bedfordensis* Hall and Whitfield, is described from the upper part of the Erie shales of Ohio, which are regarded by some good authorities as equivalents of the Portage and Chemung rocks of New York. These three are the only crinoids specifically identified from rocks of the Chemung period, or their equivalents, up to the present time.

The specimens from which the following species have been determined are mostly in the condition of moulds from which the original substance of the fossil has been entirely removed, and in such cases, casts of wax or gutta percha have been used in the description of the species.

In a few cases the material is in such an imperfect condition that a proper specific diagnosis is impossible, and accordingly no specific name has been assigned, although mention is made under the generic name of such new characters as could be observed.

In other cases a large number of individuals has been found in a single locality, among which certain variations are noted, and

by comparison of all the specimens these variations are found to be pure variations and not marks of distinct species. Crinoids are generally so rare in individual specimens that it is believed that any contribution to our knowledge of the direction and extent of the variations among the individuals of a common species is of value to palæontologists.

The author expresses his thanks to Mr. Charles Wachsmuth for valuable suggestions and assistance in the identification of genera, and to Profs. John M. Clarke and S. G. Williams for the loan of specimens.

The types of the species, not otherwise designated, are from the author's collection, and will be placed on deposit in the museum of Cornell University, Ithaca, N. Y.

Poteriocrinus Cornellianus n. s. Pl. I, figs. 1, 2 and 3.

Calyx cup-shaped; arms very long; stem pentagonal and expanding at the top, under the calyx.

Underbasals small, difficult to distinguish from the final segment of the stem; junction between the several plates indistinct and in line with ridges of the stem.

Basals large, hexagonal, height and breadth subequal.

Radials large, broad, longitudinally convex, and incurving toward the vault, the edges of two adjacent radials forming a deep groove which terminates upon the upper part of the basals. The broad convex ridge, which begins on the radials, is continued in the brachials and arms up to the first bifurcation, and is in direct line with the five angular carinations of the upper part of the stem. The upper margin of the radial, straight, broader than the first brachial.

The radial is succeeded by a single series of eight (or nine) plates, of nearly uniform size, and dorsally with no lateral expansion, strongly convex, the last plate angular above, and presenting two oblique faces from which proceed two smaller arms. These arms bifurcate a second time in the course of their length. The general appearance is that these first eight plates above the radial are brachials. But, we observe, from the ventral part of the sides of each of these plates arise pinnules on alternate sides, beginning with the third or second plate of the series.

If, therefore, we regard the presence of pinnules as a mark of the arm-plates, in distinction from brachials proper, we have

here two or three brachials followed by a single series of arm-plates, six or seven in number (the number of these plates varies for the rays of a single specimen), with strong pinnules from each plate; from the last of this series branch off two subequal rays which again bifurcate.

The arms above the bifurcation are long and thickly beset with pinnules, one from each joint; occasionally a plate is intercalated without a pinnule, but the pinnules retain their alternate order.

In the middle and upper part of the arm the joints are somewhat produced on the side where the pinnules arise. Anals, three within the calyx; the lowest touches two basals, the right posterior radial and the second and third anals. The second anal lies upon the left of the first and touches the left posterior radial. The third anal is directly above the first, and touches the radial on the right, the second anal on the left, and is succeeded by a series of plates very similar (on the dorsal view) to the lower arm-plates, but with no pinnule and with straight articular faces. This is the ventral tube. This ventral tube is very long, apparently as long as the arms, but more even in size throughout.

In the typical specimen, what is preserved of this tube is one-third the length of the arms; laterally it is beset on both sides by a fringe, about the width of the plates themselves, of narrow ridges and furrows perpendicular to the axis of the tube. There are four to six of these furrows in the length of each plate, and they continue uninterruptedly the whole length of the tube. In another specimen the tube has been preserved lying mainly outside the arms, and thirty-one plates can be distinctly seen, making a tube whose length is six times the diameter of the calyx; the final plate is about half the size of the first one. A study of the specimens at command—although all but one are in the condition of moulds in fine sandstone from which the original material is entirely removed, has enabled us to make out the general external details of structure of this "tube." (Pl. I, fig. 3, *a*, *b*, *c*, *d*.)

The dorsal aspect is that of a cylinder, from a little below the centre of which extend outward and downward lamellæ which on each side are continuous; the junction at each joint of the plates is not visible, and transversely they are marked by narrow furrows. A section shows these fringe-like lamellæ to be lateral expansions of the axial plates, thickened at the outer margins and on the ventral side terminating at a narrow, medium, longitudinal

of two series of minute plates
rse striæ do not continue over
de, but reappear in the furrow

d from the specimens, which
ube. Whether the transverse
, or of narrow perforations, or
ube, which was hollow, or an
ere engaged, are indeterminate

3.0 mm., below, 2.8 mm.; calyx,
2.0 mm.; primary radial series,
mm.; arms, first five joints at

ft. above base.
his species was collected by Mr.
land, Ohio, and presented to the
the species.
in the condition of stems and
uarry, and in the same stratum
even arms are very rare.

found by the author on a
he upper Portage, which differ
ot enough for specific diagnosis.
those of *Poteriocrinus Cornel-*
ment of pinnules, which appear
fourth joint.
more slender than those of *P.*

rom slab not in place but prob-
bove.

ing new specific, or varietal names
of the denominations *species prima*,
te genus, and *varietas alpha*, *var.*
ies as a means of designating new
cannot be satisfactorily determined

Poteriocrinus Clarkei n. s. Pl. I, fig. 4.

Calyx obconical, small, gradually expanding from the top of stem, which also gradually expands and the calyx continues evenly the rate of increase in size begun in the stem.

The radials are very convex in the centre, making a conspicuous enlargement at this point.

Underbasals of medium size, pentagonal, as high as wide.

Basals large, hexagonal, higher than wide, and twice the height of the underbasals. Radials of medium size, truncate above, irregularly pentagonal, smaller than the basals, wider than high, externally quite gibbous.

Brachials, two for each ray.

The first brachial short, cylindrical, with a straight margin above and below, height and width equal, much narrower than the radial; second brachial cylindrical, and at the base the same size as the first brachial, but near the top it suddenly expands to nearly double width, angular above, bearing two arms which do not bifurcate. In one specimen one of the second brachials bears three arms each of equal and normal size.

The joints between the primary radial plates gap, as do also, in some specimens, those of the arm-plates.

The brachials are free, parallel, and separated by a space as great as their diameter.

The surface of the calyx is marked by two rows of depressions; the first is elongate, longitudinally, its bottom lies along the suture between contiguous basals, takes in the point of the underbasal and the lower part of the radial; near the top of this groove is a horizontal ridge not reaching the general surface, but uniting the two walls of the groove, and it is more prominent in some specimens than in others.

In the second row, the depressions are smaller, triangular, pointed below, and have their centres over the angle of meeting of the basal and two approximate radials; each cavity extends upon the edges of each of these three plates.

Stem, above pentagonal with thin disks, below gradually becomes cylindrical, and the disks elongate till their length equals half the diameter, are not convex but form a smooth cylindrical stem; from this part cirri are frequent, standing at right-angles to the stem.

Anals not known.

This species resembles *Pot.* (*Scaphiocrinus*) *Whitei* Hall, '61,

, column more rapidly expand-
als being larger in proportion,
als instead of one; also, the
mined from the specimens, and
prominent at the offset of the
much alike in the two species,
similarly marked.

.5 mm., *b* 4.4 mm.; width, *a*
ase of calyx, *a* 2.4 mm., *b* 2.4
.; primary radial series, height,
, diam. *a* 1.3 mm., *b* 1.2 mm.;
, *b* 0.9 mm.; first five arm-

Co., N. Y.

Prof. J. M. Clarke, of Smith

Pl. I, fig. 5.

impression of part of a calyx
Y., in the lower part of the

he Haskinsville specimens, and
e strongly marked. The cross-
rooves is particularly strong in
ortion of plates, the differences
ly regard this as a variety of

er part.

. s. Pl. I, figs. 6, 7, 8.

of the underbasals, as wide as
d.
basals, but broader and pen-
y slightly concave.
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conspicuously concave; base,
ial.
se convex and narrow, breadth

increasing to the top, where the width is equal to the total height of the plate, the two upper edges standing obliquely at about a right-angle, and subconcave.

Surface of calyx and arm-plates smooth and gently convex.

The rapid enlargement of the consecutive series of plates up to the brachials forms a low, expanded cup. The first plates of the arm are a third smaller than the terminal part of the stem just under the calyx.

The arms are long, ten in number, and do not branch; each arm-plate bears a pinnule. Pinnules are arranged alternately on each side of the stem, and occasionally a plate appears without pinnule, but the alternate order of the pinnules is not broken. The first five or six arm-plates are cylindrical, about the length of the last brachial, and, dorsally, show little extension, either laterally, or longitudinally at the point where the pinnules are attached, but after the fifth, the side from which the pinnule starts is slightly higher and extends laterally more than the other. The centre of length of the arm of the fully developed individual is at the tenth or twelfth plate, and here the plates are a third longer than their average diameter, and the pinnules are strong, gradually tapering to a point and composed of ten or twelve plates (or six to eight in the shorter pinnules); the first one is about half the size of the base of the arm-plate, from which it springs.

The arms are spreading, and an occasional specimen is found spread out radiately upon the surface of the slab.

The anals, and succeeding plates of the ventral tube, are not apparent on all specimens, but from examination of all the material at hand, we conclude that the arrangement of the proximal plates of the series is that normal to the genus *Poteriocrinus*, as defined by Wachsmuth and Springer, but the origin is frequently higher up in the calyx. In several specimens the anals do not reach the basals, but begin on the slopes of the two adjoining radials, which meet under them; but one specimen, which appears very well preserved, without distortion, has the normal arrangement of anals, three plates being in contact with calyx plates; the lowest lies a little to the right, between the adjacent, upper, sloping edges of two basals; above these anals can be distinctly seen, three or four plates in each of the two series of the ventral tube. The irregular position of the anals among the calyx plates possibly may be accounted for by distortion of the

specimen by pressure, but this is not self-evident, but inferred to explain what appears to be abnormal. Attention is drawn to the fact to show that species or genera established upon single or few imperfect specimens are not always to be relied on.

The stem is composed of discoid segments, externally convex and serrate at their union; arranged in two sets, one thinner than the other, in alternate order. The difference is greatest near the base of the calyx, where also the plates are thinnest; the thickness (or length) of the individual joints increases with distance from the calyx; the size of the stem slightly diminishes, and the difference between the two sets becomes obliterated, until the joints reach a length equal to their diameter, and the serrate union is inconspicuous, the outer surfaces becoming very convex. This latter is the common character of the central part of the stems, the joints being subglobular and of uniform size. Slender cirri proceed from all along the stem; they have been observed within an inch of the calyx, and are generally found rather closely coiled at their ends.

The upper part of the stem appears slightly pentagonal, but the angles are rounded and within an inch of the base of the calyx all trace of them is lost.

Dimensions of type specimen—which are a little greater than for the average of the specimens examined: Stem, diameter, 1.3 mm.; calyx, width, 2.3 mm.; arms and body together, total length, 21.6 mm.; primary radial series, height, 3–3.3 mm.; second brachial, width, greatest, 1.4 mm., average, 1.2 mm.; first five arm-plates, length, 4.1 mm.; second five arm-plates, length, 5.1 mm.

Locality.—Ithaca, N. Y.

Horizon.—Chemung group, 130 feet above base.

Three varieties are noted among the numerous specimens and fragments taken from the same stratum with the type specimen.

Var. *alpha* is distinguished by its smaller size, and the arms shorter, and composed of fewer, more slender plates.

Those characters of the stem, peculiar to the terminal portion, just under the calyx, are seen for only a very short distance.

The calyx and its plates do not differ, to any appreciable degree, from those of the specific type, in number, arrangement, relative size or shape.

Var. *beta.* The calyx is large, the plates well developed, the stem as large as in the typical form, and up to the base of the

arms this variety appears identical with the type of the species, but the arms are exceedingly short—not more than six plates appearing in the longest arm preserved.

One of the arms begins with two full-size plates, starting out, and in shape, like the typical form, but these plates are followed by three very slender plates, the base of the first not filling completely the facet at the top of the preceding one. The arm adjoining it has one normal-sized plate, followed by four slender plates. The other arms, as far as they can be examined, show a like arrangement, and the explanation is unavoidable, that the original arms were broken off, and were being replaced by new arms not fully developed when growth and life were stopped and the hard parts buried, and thus preserved to tell the story.

Var. *gamma.* A third variety is worth mentioning. In general characters it corresponds with var. *alpha*, but differs conspicuously in the plates of the ventral tube. At the base the anals are arranged as in the normal specimen, while the upper part appears to have special development.

There appears on the right side of the normal series of anal plates, beginning about half way up, a third series of plates about the same size as those at the corresponding height in the other series. The series, beginning lowest down, thus becomes the central one at the top, and eight plates can be counted in it. The lateral series have fewer plates, and the upper part loses itself in minute granulations at the base of the arms.

This species, of which many specimens were taken from a small locality, shows considerable variation in the length of the arms, in the number, relative size and shape of the arm-joints, in the character of the stem-joints at the base of the calyx and a short distance below until the normal characters of the stem are reached, and in the number and arrangement of the more distal part of the plates following the anals.

In these several respects the specimens under examination present hardly two which are uniform, and single specimens show more or less variation in the several rays.

There is also considerable difference among the specimens in the relative shape of the calyx and in the general arrangement of the arms, which is explained mainly by different degrees of, and direction in, compression since the specimens were buried.

The difference in the arms and arm-joints, we are led to believe,

is the effect of difference of age of the specimens. Thus, we observe, in this species, that the smaller specimens have less expansion of the stem at the top, the thin disk-like stem-joints are limited to a shorter distance downward from the calyx; the arms are shorter, the arm-plates fewer, and more slender, and apparently more uniform in size and shape than in larger specimens. In larger specimens, with the more fully developed arms, we observe the plates at the base are strong, length about equal to width; in the middle portion of the arm, they are more slender and only slightly diminished in diameter; in the upper part, the plates are of a medium length, but are strongly developed on the side from which the pinnule starts, and the stem becomes more or less zigzag in shape; with all these differences, the articular faces between the arm-plates show only very slight tendency to become oblique, a character so conspicuous in other species of the genus.

The pinnules normally start from every joint first on one side, then on the other, but frequently variation is seen in this respect, by the interposition of a plate without pinnule; in some cases this occurs frequently on a single arm, giving the appearance of pinnules from every other plate. In no case is the alternate order of the pinnules disturbed by this variation.

The differences in the plates succeeding the anals appear to be purely varietal, and associated with no concomitant variation in other parts, and may be due, in a measure, to differences in state of preservation.

The normal arrangement of anals is that of *Poteriocrinus*, as given by Wachsmuth and Springer, "Palæocrinoidea," '79, p. 110, but if we regard the calyx as stopping with the top of the radial we should have several cases where the anals are entirely above the calyx, as the lowest anal lies in the angle formed by the upper oblique faces of two adjacent radials. This accounts also for a narrower calyx.

Another specimen has but a single series of anals, resting upon the upper, sloping margins of the adjoining radials, thus reminding us of *Heterocrinus*. Still a third (see var. *gamma*) starts with two series of plates at the base, which appear to reach the basal series, and opposite the first brachial, a third series starts in on the side. Other specimens show the normal *Poteriocrinus* arrangement of anals, the first plate resting between the upper

angles of two basals, followed by two plates touching the adjacent radial, as explained above.

This species offers points of resemblance to several species of the genus, but it appears to be distinct, even allowing the great variation. As one feature after another is examined in the different specimens, such species as the Ohio *Scaphiocrinus subtortuosus* of Hall, the Burlington, *Scaphiocrinus fiscellus*, Meek and Worthen, and several others are recalled; but the species, taken as a whole, in its general features as well as in the details, appears most nearly related to *Poteriocrinus diffusus*, Hall, '62, 121, and *Pot.* ("*Scaphiocrinus*") *ægina*, H., '64, 57—the former from the Hamilton group of New York and the latter from the Waverly group of Ohio.

Prof. Hall has noted the resemblance of the two to each other; one point of difference is in the arm-plates. In the Hamilton species every second or third plate bears a pinnule, and "the intermediate joints are shorter than those bearing armlets."

The Waverly species bears pinnules from each plate.

The species under consideration shows considerable variation in this respect even on a single specimen. The writer has not had access to the types of the two species above referred to, but from study of the figures and descriptions, together with the fine series of specimens of *P. gregarius*, it would not seem unreasonable to expect that specimens may eventually be found uniting all three species into one.

Poteriocrinus (Decadocrinus) Zethus n. s. Pl. I, fig. 9.

Body turbinate, with two long, slender brachials to each ray. These long brachials, with the arms, form a narrow elongate head with subparallel sides.

Underbasals minute, height and width about equal. Basals ("subradials" of Hall), a little higher than wide, rounded hexagonal. Radials wider than high, rounded pentagonal, the upper edge nearly straight, but falling off a little at the corners, beyond the base of the first brachial, which is narrower than the greatest width of the radial.

Brachials, two for each ray, subequal in length, cylindrical, twice as long as wide, length of each about that of height of calyx; the second brachial expanded at the top with inclined faces for attachment of first arm-plates.

Arms short, slender, the plates few and fully twice as long as wide.

The arm bears a pinnule at the third joint; (or bifurcates at this point, the specimen is too imperfect to determine which).

Anals unknown.

Column rounded, relatively strong, not expanding under the calyx, composed of two kinds of joints, alternating regularly, from above, first a thin, then a subglobular joint, and not varying in size or proportion for the length of stem exposed.

Dimensions.—Diam. stem, 0.8 mm.; calyx, width, 2.2 mm.; calyx, height, 1.5 mm.; primary radial series, length, 3.5 mm.; second brachial, mean width, 0.7 mm.; first arm-plate, length 1.0, width, 0.3.

This species resembles *P. Nycteus*, Hall, '61, 120, but the brachials and arms are stronger, and the brachials longer in proportion to the calyx. The resemblance suggests the name for the species, *Zethus*, who was the grandson of *Nycteus.*

Locality.—Ithaca, N. Y.

Horizon.—? Portage group, from a loose slab near the the top of the Portage, and supposed to have fallen from the rocks just above where found.

In collection of Prof. S. G. Williams, Cornell University.

Taxocrinus Ithacensis n. s. Pl. I, fig. 10.

Body expanding moderately; calyx shallow, broad; arms strong, of medium length, the whole head rather slender for the genus.

Underbasals minute but appearing as a thin, irregular band above the last stem segment.

Basals small, low, subpentagonal.

Plates of the first radial series, strong, large, well developed.

Radials pentagonal, upper edge deeply sulcate, broader than high; articulation with first brachial narrower than the full width of plate; surface broadly convex.

Brachials, two for each ray. First brachial subquadrate, width and height about equal, wider at top than at bottom, upper margin broadly sulcate.

Second brachial, the largest plate of the body, expanding above, subpentagonal, upper margin angular.

Primary arm-plates, four (or rarely five) strong, about half the size of brachials; the arms branch twice (or three ? times); each branch of four or five plates.

Arm-plates convex, but not angular, about as high as wide; no

pinnules seen; each arm-plate deeply sulcate on its upper edge for articulation with the following plate, the upper angle produced ventrally so as to appear subauriculate on a side view.

Stem strong, round; the joints under the calyx thin and crenulate at margins; the thickness increases gradually for half an inch downwards, then there appear two sets, one thick, one thin; the thick plates increase in thickness and become strongly convex; the thin disks finally appear to drop out, and the main part of the stem consists of long nearly cylindrical joints, only slightly convex, and united by finely serrate margins. The root is a simple, low, conical expansion of the end of the stem, and is found attached to the shell of *Spirifer lævis*, in several cases.

Dimensions.—Stem (just below calyx), diam., 2.9 mm.; width of calyx, 5. mm.; primary radial series, height, 4. mm.; second brachial, width, 2.8 mm.; first four arm-plates, length, 4. mm.; total length of body and arms, 20. mm.

Locality.—Ithaca, N. Y.

Horizon.—Portage group, *Spirifer lævis* beds.

Taxocrinus Ithacensis, var. alpha n v.

This variety is about half the size of the typical form of the species occurring three or four hundred feet below.

The arms are shorter, and attain only the second bifurcation.

The stem, at the top, has but a few of the uniformly thin disks, the alternate sizes beginning to appear much nearer the base of the calyx (within a quarter inch) than in the typical form. Otherwise, the calyx—the shape and number of plates in the calyx and in the primary radials—the first series of arm-joints, four (rarely five)—the second series, four or five—their convexity, and all other characters observed (except the smaller, and slightly shorter, stunted form), are precisely as in the type specimens of the species.

In some specimens of this variety, one of the arms is observed to have but two primary radials, the other rays have three. This I can look upon only as a varietal character, as in the secondary series we generally see variation in each specimen from four to six joints.

Locality.—Ithaca, N. Y.

Horizon.—Chemung group, about three hundred feet above the *Spirifer lævis* beds of the Portage group.

Taxocrinus curtus n. s.

In general appearance this species resembles variety *alpha* of *T. Ithacensis*, but is still shorter, and the calyx is very low and widely expanded.

The underbasals do not appear on the surface.

The plates of the primary radial series are striate, or subcarinate along the centre, with faint parallel striations each side, and the surface indistinctly granular; total length of the three is once and a quarter the width of the second brachial.

Basals relatively smaller, about the height of the radial.

Radial very short, broad, sublunate.

First brachial subquadrate, height less than the width, which is less than the width of the radial.

The second brachial is the largest plate of the body, wide, pentagonal, with two broad, oblique edges for attachment of arms.

The arm-plates are less deeply sulcate at the upper margin than in *T. Ithacensis* or in the variety *alpha*.

Primary arm-plates, four, or three, convex, subcarinate. The central striæ, or carinations, are continuous from the brachials to the end of the rays, diverging at each axillary plate. The stem is composed of two sets of joints, the one thick, the other thin, from the base downward and it does not expand at the top as in *T. Ithacensis*. The very thin plates with crenulate edges, occurring under the calyx in that species, are wanting, as are also the extra large joints occasionally appearing along the upper part of the stem.

At first sight the types of this species appeared like extreme varieties of *T. Ithacensis*, in the line of var. *alpha*, but upon close comparison it is observed that not only are the arms shorter and of fewer joints, but the whole body is more stunted, and the primary radials, as a whole, and the individual plates composing them are proportionately shorter and wider than in that species, and the striation of the plates is not observed in any of the specimens referred to *T. Ithacensis*.

As fossils are defined, this is doubtless a distinct species, but it would not be surprising if a larger series of specimens should reveal the fact that the characters upon which it is founded are of no more than varietal value.

Locality.—Ithaca, N. Y.

Horizon.—Portage group, *Spirifer lævis* beds.

Melocrinus Clarkei n. s.

The shape of the calyx cannot be determined on account of the crushed condition of the specimens, but the shape and number of the plates agree so well with those of *M. Bainbridgensis*, H. and W., that it is probable that the shape was the same, *i. e.*. broadly turbinate. In size, also, the calyx agrees well with that species.

No underbasals appear.

The basals are low, wide and pentagonal.

The radials are more than double the size of the basals, height and width equal, or wider than high. The variation in the shape of this plate, in the several specimens upon the one slab, covers the extremes met with in the two species *M. Bainbridgensis* and *M. breviradiatus.*

The radial is followed by two brachials of smaller size, the first hexagonal, the second pentagonal and angular above, and each is about equal in height and width.

The second brachial supports two arm-plates (still within the calyx), nearly as large as the brachials, irregularly pentagonal and meeting at their inner edges.

Of the secondary radials, three are within the calyx, the second is about half as high as wide, the third is very short. The third pair of secondary radials together bear a strong arm, gradually tapering to a point, about three times the length of the calyx. It is broad, flattened on the back and longitudinally depressed along the centre, and is composed of a double series of very short plates, meeting at the centre and arranged in opposite (not alternate) order.

On the outer and ventral side the arm bears long, slender, cord-like branchlets, which appear to have fine thread-like appendages along their sides. In the central part of the arm these branchlets are as long as the arm itself. They proceed from every third arm-plate, instead of every fourth, as in *M. Bainbridgensis*, and the plates from which they appear are opposite each other, and their outer sides are lengthened slightly.

The interradials are apparently like those of *M. Bainbridgensis*, beginning with a large plate between the upper parts of two adjacent radials, followed above by two smaller plates, and these by more still smaller plates, the number or arrangement of which is not uniform.

The calyx-plates are marked by granulations over the central

portion, are rounded at the margins, which in some cases are elevated slightly above the central part of the plate, causing a depression, as in *M. Bainbridgensis;* other plates (even on the same specimen) are convex, as in *M. breviradiatus.* The rows of fine ridges, connecting the calyx-plates at their juncture, are very distinct in some cases, and do not appear in others. The former is a character of *M. breviradiatus.*

The stems are composed of alternately thin and thick plates, the relative order, or proportions of which, are not constant, even varying on the same stem when preserved for long distance.

This species is closely related to *Melocrinus Bainbridgensis*, Hall and Whitfield, 1875, from the Huron shale, Bainbridge, Ohio, and to *M. breviradiatus*, Hall (figured on a plate of "New Crinoidea, Pl. 1," which was published, with explanation of plates, in 1872), from the Hamilton group.

The study of the specimens (all on a single slab), from which the above diagnosis is made out, has revealed the fact that apparently all the characters distinguishing the two species just named are variable in those specimens. The arms must be excepted; none are known for *M. breviradiatus*, and those described for *M. Bainbridgensis* were not found attached to any calyx.

While, therefore, we retain a distinct specific name for the specimens under consideration, we are led to believe that examination of a larger series of specimens may make it necessary to unite these three species in one.

Locality.—Ontario County, N. Y.

Horizon.—Genesee slate (? Portage group).[1]

This species was discovered several years ago, and by Prof. N. T. Clarke, of Canandaigua, N. Y., was brought to the notice of Prof. James Hall, who gave it the name "*Ctenocrinus Clarkei*," in honor of Prof. Clarke. But as no description or figure was made of the species we publish it as new under the specific name proposed by Prof. Hall.

Among the material collected by Prof. John M. Clarke from

[1] [The specimen above described belongs to the fauna of the Hamilton (not Chemung) period.

A second specimen, which I have not seen, came from Portage rocks; and this second specimen, Prof. J. M. Clarke informs me, is apparently the same species but has never been scientifically identified.] —H. S. W.

the Chemung rocks at Haskinsville, Steuben Co., N. Y., are two species of *Poteriocrinus*, belonging to the type of *P. Cornellianus*, but evidently distinct. The specimens are so imperfect that a satisfactory specific diagnosis cannot be made out, but we will record the characters which can be distinguished.

Poteriocrinus (*sp. secunda*).

Stem at the top strongly pentagonal, carinate and expanding.

Calyx small, rapidly expanding. Arms large, and arm-plates convex.

Underbasals small, low, broad, arched above, subpentagonal.

Basals a little higher than underbasals, and twice as wide as high.

Radial twice as large as basal, broad, sublunate, with the points turned upwards.

Primary radials very large, nearly as wide as the calyx below the radials, composed of short plates with straight sutures and of at least seven plates; the specimen is imperfect just before the bifurcation.

There are small, deep pits in the calyx at the lateral and upper angles of the basal-plates as if their corners had been abruptly bent in toward the centre. The upper part of the stem and the numerous primary radials are features resembling *P. Cornellianus;* but the specimen is fully twice as large; the calyx is much smaller and expands more rapidly, and the pittings of the calyx are peculiar.

Poteriocrinus (*sp. tertia*).

Stem roundish, subpentagonal near the top, with cirri standing out obliquely and straight from the stem, of which several appear within an inch below the base of the calyx.

Calyx low, small.

Underbasals cannot be distinguished, but evidently present and small.

Basals about as high as wide and nearly as large as the radials.

Anals unknown.

Radials subpentagonal; the insertion of the first brachial occupies the full width of the plate. There are six plates in the primary radial series; pinnules appear from the plates above the third. The sixth primary radial (the fifth brachial) is angular

above and from it the ray bifurcates. On each side pinnules start from every alternate plate.

Pinnules short.

This resembles *Pot. Cornellianus*, but it is considerably larger, the stem is less strongly pentagonal at the top, and the primary radials are six, instead of eight or nine, as in that species.

The specimen is on a slab with *Dictyophyton.*

Locality.—Haskinsville, Steuben Co., N. Y.

Horizon.—Chemung group.

EXPLANATION OF PLATE I.

A NEW STATION FOR COREMA CONRADII, TORR

BY AUBREY H. SMITH.

This rare plant was formerly collected in the Pine Barrens of New Jersey, by Torrey and Knieskern. It is now lost from the places indicated by them, though diligent search has been made for it there by Messrs. Redfield and Parker.

It was at one time found on Long Island, but not of late years. It is probably extinct both in New Jersey and on Long Island.

It has been found on Cape Cod and on the Kennebec, New Bath, Maine, and in Newfoundland. Whether it is now to be found in these places or not I am not informed.

The specimens which I exhibit to-night were collected in the Palmaghatt Glen or Pass of the Swawangunk Mountains, by Mr. Edward A. Smiley, at my request, in October of the present year. His father, A. H. Smiley, the proprietor of the Minnewaska House, informed me in the preceding month of August, that there was a singular little plant, with the aspect of a very small cedar, growing on a ledge of rocks on the Palmaghatt, some two and a-half miles from his house.

From the rather inaccurate description of it given me by him and his son, whose intelligent curiosity had also been directed to the plant, I surmised that it might be *Corema.*

I therefore engaged Mr. Smiley at the first opportunity to collect, and send me by mail, specimens of it.

It grows, Mr. E. A. Smiley writes me, on the edge of a precipice of upper silurian rocks of Ulster County, in a very thin soil. In May next I hope to have from him specimens in flower and fruit.

The plant appears to be one of those which are verging to extinction, the conditions of its environment seeming to be against its prolonged life.

PROCEEDINGS

OF THE

MINERALOGICAL AND GEOLOGICAL SECTION OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA.

1880–1881.

JANUARY 26, 1880.

Some New Pennsylvania Mineral Localities.—Mr. CHAS. M. WHEATLEY reported, through Mr. Lewis, the following localities not mentioned in Dr. Genth's Report on the Mineralogy of Pennsylvania: Jones Mine, Berks Co., Pa.; Aurichalcite, Melaconite, Byssolite. Upper Salford Mine, Montgomery Co.; Azurite.

Pseudomorphs of Serpentine after Dolomite.—Mr. H. CARVILL LEWIS drew attention to some specimens of associated serpentine and dolomite which he had found within the city limits, and which appeared to be pseudomorphs. He had found them in the Twenty-second Ward, on Paul's Mill Road, near the Wissahickon Creek. A range of serpentine and steatite here crosses the creek, being the same which crosses the Schuylkill at Lafayette and continues through Montgomery County in a southwestwardly direction. It here appears to conform closely, both as to strike and dip, with the adjoining gneiss, whatever its origin. All along its northern edge the steatite is filled with hard nodules of dark serpentine, which Mr. T. D. Rand has shown to be pseudomorphous after staurolite.[1]

At the locality mentioned, this peculiar rock contains veins or lenticular beds of massive, cleavable dolomite. This dolomite is frequently traversed in the three directions of its cleavage-planes by thin seams of serpentine, while irregular masses of steatite or serpentine also run through it or protrude into it from without. When the interpenetrating serpentine is in a thin seam it may frequently be observed to assume a pseudomorphic character. It may assume the shape and external characters of dolomite, while retaining the color and composition of serpentine. It then possesses both the rhombic cleavage-planes and the jointed structure of the dolomite, and often, also, its characteristic transverse striæ. In some of the specimens collected the serpentine presents a step-like appearance, and when it coats successively

[1] Proc. Acad. Nat. Sciences, 1871, p. 303.

alternate blocks of dolomite, rising one above the other, it might be compared to a flight of tiny white marble steps, covered by a green carpet.

At times, whole blocks of dolomite are replaced by serpentine. Transverse striæ have been noticed only on very thin seams, yet here they are quite as distinct as upon the adjacent dolomite. Rhombic cleavage-planes, however, are very common throughout the serpentine, although, unlike the dolomite, these markings are generally only superficial. In very exceptional cases the eminent rhombohedral cleavage of the dolomite is retained by the serpentine. While the serpentine has thus acquired the external form of dolomite, it possesses its identity as serpentine. When broken it shows the irregular or conchoidal fracture characteristic of true serpentine. When a fragment is immersed in warm acid, a momentary effervescence often takes place, owing to the adherence of thin scales of dolomite, as proven by the microscope.

No actual passage of dolomite into serpentine has been observed on the specimens collected. The two minerals are distinct. The line of demarkation between them is always sharp; pure serpentine lying in juxtaposition with pure dolomite. The dolomite is the white, glassy, cleavable variety, containing about one and one-half per cent. of carbonate of iron, as determined by volumetric analysis.

From the description which Professor Dana has given of the serpentine pseudomorphs found at the Tilly-Foster iron-mine,[1] it appears that in several particulars those of the Wissahickon are quite similar.

In the use of the term *pseudomorph*, it must not be understood that it implies an actual alteration. The specimens here described may be classed as *pseudomorphs by substitution*. It appears that the dolomite has not been altered into serpentine, but has been replaced by it. As is probably the case with all pseudomorphs by substitution, the original material is more soluble than that which is substituted. Whole rhombs of dolomite appear to have been dissolved and simultaneously replaced by the deposition of serpentine.

That this is a case of pseudomorphism by infiltration and replacement, is indicated by the fact that in one specimen a rhomb of dolomite is replaced by magnetic chromite. The chromite occupies the full width of the narrow seam of serpentine for a short distance, and was evidently deposited from the same solution which held the serpentine.

In discussing the origin of these and similar pseudomorphs, it is important to bear in mind the fact of the sharp juxtaposition of the two substances, and the consequent possibility of their having been formed contemporaneously. It must also be remembered that the dolomite, which contains the pseudomorphs of serpentine,

[1] Amer. Jour. Science, vol. viii, 1874, p. 371.

lies itself in a bed of serpentine, and that it is therefore possible that the pseudomorphs were formed at the very time of the original crystallization of the dolomite. If we grant that the dolomite, and the bed of serpentine which contains it, were formed simultaneously, it may readily follow that the minute pseudomorphous seams of serpentine *within* this dolomite were enclosed during the very act of crystallization of the dolomite. With this view, we might regard these pseudomorphs by substitution as having been deposited, not by an infiltrating solution from without, but by a solution which was being *expelled* from the interior of the dolomite by the crystallizing power of the latter. If such were the case, the serpentine would readily assume the *habitus* of the dolomite, and the same crystallizing force which caused the cleavage-planes and the transverse striæ upon the dolomite would superinduce them upon the enclosed serpentine.

Contemporaneous pseudomorphism implies a pseudomorphism by association. True pseudomorphism by substitution, like epigenesis, is subsequent. While not attempting in the present case to determine the relative time and, therefore, the kind of pseudomorphism, the foregoing remarks are offered merely as suggestions in reference to a subject already so fully discussed by eminent writers.

New Localities for Barite.—Mr. Lewis contributed the following new Pennsylvania localities for barite:

1. Bridgeport, Bedford Co. It occurs here in small tabular crystals in red Catskill sandstone (No. IX).

2. Broad Top Mountain, Huntington Co. Thin transparent coatings of barite frequently cover the fossil ferns and calamites which occur in the carboniferous shales and fire-clay adjoining the semibituminous coal-seams of Broad Top Mountain.

3. Lancaster Station, Franklin Co. It occurs here in large white cleavable masses.

February 23, 1880.

New Localities for Chabazite.—Mr. Lewis Palmer announced two new localities for chabazite. It occurs in red crystals in a hornblendic gneiss at Waterville, near Chester, and also at Upland, Delaware Co.

On a New Ore of Antimony.—Mr. H. C. Lewis described an oxide of antimony found at Senora, Mexico, which he had been unable to identify completely with any known mineral. Under the supposition that it was a tin ore, it was sent to him by Mr. T. H. Shoemaker for examination.

The mineral generally occurs as a massive, compact, hard sub-

stance, with an imperfectly conchoidal cleavage and of a pale grayish yellow color. It also occurs as minute colorless octahedral crystals of glassy lustre. The crystals often occur in druses in the massive mineral, and are sometimes modified. Their form can only be distinguished with the microscope. Neither the crystals nor the massive substance show any colors in polarized light, and the mineral is therefore isometric. Special care has been taken to prove the identity of the octahedral crystals with the massive mineral. So far as could be determined with such minute crystals, their hardness and their behavior in the open tube were identical with the massive mineral.

The mineral here described has the following physical characters: Isometric. Habit octahedral. Generally massive. Hardness, 6.5–7. Specific gravity, 4.9. Lustre of the crystals glassy; of the massive mineral sub-resinous or sub-vitreous. Color, pale grayish yellow. Streak uncolored. Transparent in crystals, opaque when massive. Fracture sub-conchoidal.

A thin section of the purest mineral examined under the microscope shows an entire absence of any foreign admixture. The structure is banded, the bands consisting of more or less opaque material, and the general appearance of the section recalling a section of muscular fibre. It has the following blowpipe characters:

On charcoal before the blowpipe, it is fusible with difficulty and decrepitates strongly. It gives a white coating of oxide of antimony, and fuses to a gray or bluish gray slag and is partially reduced to metal. With carbonate of soda on charcoal it is more readily reduced. In the borax and salt of phosphorous bead the slag dissolves and gives it generally a blue color, due to a trace of cobalt. In the closed tube it gives off water, decrepitates with violence, turns deep yellow when hot and becomes white when cold. It does not fuse or give a sublimate in either open or closed tube. When the slag formed by fusion on charcoal is moistened and placed on turmeric paper, it forms a brown stain.

The following are its chemical characters:

It is partially dissolved by digestion in concentrated hydrochloric acid, and by the addition of water to the yellow solution thus obtained white oxychloride of antimony is precipitated. It is decomposed with great difficulty, even after fusion with sodic carbonate and sulphur. On account of the difficulty of getting it into complete solution, no quantitative analysis has as yet been made. It has been found to consist mainly of oxide of antimony and to contain small percentages of lime, iron and water, and traces of arsenic cobalt, and lead. It has 3.1 per cent. of water. Until an exact analysis is made it will not be possible to determine its mineralogical equivalent.

Several tests indicate that the antimony exists mainly in the state of antimonious oxide. It differs from senarmontite and

and in solubility; from stibic-
repitation, and in its occurring
fusibility and in its behavior
e in the amount of water.
contains crystals and small
ains also small seams of a soft
bably stibiconite, a product of

rk.—Mr. JOHN FORD exhibited
ilmenite), found by Mr. G.
t had been quarried from the
e, Fairmount Park. Though
e character, this specimen is
utiful of any found in or near
lustrous in appearance, and
h in thickness by one inch in
an almost perfect half-circle,
dgewise in a matrix of quartz.
ar form of the crystal is due to
g of the bed of schist in its
can be little more than a sup-
crystal, measured around the

, 1880.

Yardleyville, Pa.—Mr. H. C.
often that a section of a well-
y. Frequently a fault starts a
all trace of it, and the actual
s either occupied by a stream
n only be inferred from adjoin-
ht that it might be of interest
which he had recently observed
ailroad.
Yardley Station on the Bound
s a fine section of lower triassic
ault occurs in about the middle
th sides of the railroad, but is
fault between the lower white
but here adjacent, red shale.
r nearly at right-angles to the
d of the cut exposes conglom-
end red shale, both of which
ip gently to the north. These
another by the nearly perpen-
ch occupies the line of fault.

...layey material of a
...ut 5½ feet in width.

Surface drift.

White conglom-
erate.

N. E.

...VILLE.

...formations with the
...structive example of

...of red shale and an
...f eruptive trap has
...It is of interest to
...stone, overlying the
...adjacent to the trap,
...pressure from below
...cises great mechani-
...surface, is shown by
...vlvania, the triassic
...ve their dip altered
...lle, for example, the
...es changed in the
...the normal dip, to
...e below the surface
...gillite and reversed
...é, that the trap has
...oses it in the case

… 24, 1880.

… OF RADNOR AND VICINITY.

… O. D. RAND.

… plished in the Proceedings of the
… ety (January to March, 1880; vol.
… efore the Society, January 2, 1880,
… lations of the Crystalline Rocks of
… the conclusions in which so differ
… a statement of the latter may not
…, as regards the middle serpentine
… been studying for some time.
… series of rocks and two serpentine
… arefully examined but the second,
… the serpentines. The second, he
… yenitic, hornblendic and quartzose
… rom Chestnut Hill, and covering a
… ortion of Delaware County."
… in Delaware County as "Radnor
… e in that township, are in abundant
… s, perhaps the most remarkable of
… truncated cone, perhaps 400 × 800
… but not precipitous sides, 80 to 100
… hester County nearly south from
… object in the landscape. North of
… by Prof. Rogers in the Geology of
… imal older slates, and well described

… racteristic white streaks of imper-
… nd dark hornblendic material, with
… llized feldspar."
… mposed generally of thin layers of
… r being abundant, mica, hornblende
… ayers from almost nothing to great
… r; and many of these layers often
… t times a schistose character to the
… nde never so abundant that it can

properly be called schist. The minerals composing this rock closely resemble those of the gneiss on the south; so close is the resemblance of certain strata in the one, to some of the other, the difference being chiefly in mode of aggregation, that it seems to me not improbable that the northern are but upper strata of the southern gneiss.

The fifth group of Mr. Hall is described as "Hydromica schists, quartzose schists, chloritic schists and occasional beds of quartzite and sandy beds, and serpentines," of which he says, page 436: "These are the Hudson River shales and flank the Chester Valley on the south * * * the entire length of the Valley. They extend south to the syenitic rocks of the second group." Mr. Hall does not mention the schistose gneiss, nor is it possible to include it under his description of either the second or fifth groups which he places in contact. On page 441 he says: "The serpentines of Radnor Township, Delaware County, and those of eastern Willistown, east and west Goshen, are undoubtedly altered beds of the South Valley Hill slates or Hudson River slates. They lie unconformably upon the syenitic rocks of the second group." There are, as I have heretofore shown (Proceedings Acad. Nat. Sci., Philada., Nov., 1878), three approximately parallel beds of serpentine in Radnor Township. Presuming, as seems from the connection with the Chester County outcrops, that the middle and most conspicuous belt is intended, I cannot agree with Mr. Hall in his conclusions.

This middle belt is the largest of the three, and north of the syenite hill appears first on the Mattson's Ford or township line road, on the westerly side of a small affluent of the Gulf Creek, one-quarter mile northeast of Radnor Station, with a strike nearly E. and W. The serpentine forms a large hill, which begins abruptly and closely resembles in lithological character that of the Lafayette or Rose's quarry belt. The next or second outcrop is nearly west of this and is inconspicuous. The third, northwest of Radnor Station, is about 1000 feet in length. Its centre is nearly due west from the first; the strike is not far from N. 60 E. This outcrop ends abruptly. About 400 feet north is a small outcrop appearing as if the end of the ridge had been removed 400 feet northward. Beyond this I believe no outcrops have been described until we reach those near Paoli, but several exist: the fifth, nearly S. from Eagle Station, small and the strike indistinct;

[illegible] 70° W. from the fifth, with a strike [illegible] 0° S.; the seventh is nearly due W. [illegible] . 50° to 60° E.; the eighth is a little [illegible] ike and dip not distinct; the ninth, [illegible] ng S. E. from Berwyn, and about a [illegible] its eastern end S. 10° W. from the [illegible]. The outcrop near Paoli is nearly [illegible] ence as the wide and well-known belt [illegible] est Chester.

[illegible] outcrop, that on the Mattson's Ford [illegible] ocks of group one without doubt, but [illegible] dentical rocks—hornblendic gneiss, [illegible] pathic gneiss. It is difficult to con- [illegible] udson River shales. Beyond them [illegible] Prof. Rogers, before referred to, then [illegible] ine, then gneiss, and occasionally (to [illegible] netiferous mica schist, then limestone, [illegible] ne-quarter of a mile from the serpen- [illegible] f the South Valley Hill, agreeing [illegible] escription of the fifth group. These [illegible] westwardly, until the serpentine, the [illegible] sts of the South Valley Hill appear to [illegible]

[illegible] and of the southerly border of the [illegible] or, it appears in contact, separating [illegible] r slates, being about S. 70° W., the [illegible] re much closer at the western end of [illegible], the intermediate strata thinning out [illegible] e perhaps crossing them in part; but [illegible] 0 feet of the schistose gneiss between [illegible] us mica schist, which seems to con- [illegible] to the trap to near Paoli.

[illegible] nap accompanying Prof. Hall's paper, [illegible] made continuous from near West [illegible] nty in a straight line, except at the [illegible] southerly curve occurs near the line [illegible] rrying the serpentine well into the [illegible] y observations are correct, this line [illegible] inted lines, the easterly end of each [illegible] sterly end of the succeeding; but, in

any event, if the map is correct as to the eastern extremity, the text is not so.

Mr. Hall's seventh series, page 436, is "The mica schists of Philadelphia * * * talcose schists, with soapstone and serpentine. They rest unconformably upon the first, second, third and fourth groups. * * * There are, besides these groups, probably two serpentine horizons, which are undoubtedly unconformable deposits above the second group. I think the northern belt of serpentine may be considered as altered Hudson River rock, while the southern belts are doubtful."

Page 441–442: "Dr. T. Sterry Hunt insists that the serpentines of the Schuylkill are below the Philadelphia schists. * * * At present I am inclined to place these serpentines above the Philadelphia rocks, and by so doing assign the Philadelphia series to a higher group than the Hudson River. * * * To all appearances the serpentine belts which are visible on the Schuylkill River at Lafayette Station, Montgomery County, and at a point just north of them, are above the mica schists of Philadelphia. The southern belt extends in an almost unbroken line from Chestnut Hill, Philadelphia, to Bryn Mawr, Montgomery County. A less prominent belt extends from the Schuylkill River to the neighborhood of Rosemont Station, on the Pennsylvania Railroad, in a parallel line to the first belt."

The meaning of the author in the two opinions first quoted, from pages 441–442, is not altogether clear. If there is dependence to be placed on lithological characteristics, the southern or soapstone belt continues far to the southwestward; as to it, I believe, belong the outcrops on Meadow Run, on both sides of Darby Creek, near Moro Phillips' chrome-mine, in Radnor Township; thence southwestwardly continuously through Newtown and Marple Townships. In this belt there is one rock described by me many years ago characteristic of it, and, so far as my knowledge extends, confined to it (except outcrop at Rosemont hereafter referred to) a steatite filled with crystals of serpentine pseudomorphous after staurolite. This rock is very abundant and prominent from Chestnut Hill to a point a short distance west of Mill Creek, and is found also, but not abundantly, west of Darby Creek. The northeasterly portion of this belt contains very little serpentine; steatite and chlorite constitute the greater part of its mass. Its strike is about S. 52° W., its bounding

...ke garnetiferous schist; partially
...apstone quarry on the Schuylkill
...en from the pseudomorphism or
...ed hornblendic and micaceous
...ns quite a number of minerals.
...ary, is little else than a very dark,
...chrysotile and asbestos, and some
...stitute of minerals, and at Rose's
...ned, not from Hudson River shales,
...tic rock visible there in place, and
...d. It extends from the Schuylkill
...n Barr's farm, where, as a hill, it
...aced by fragments to an outcrop
... the house of William Schalliol,
... line of strike. Thence it crosses
...f a small stream, with a course
...r crossing seems to curve even
...n a hillside and is probably due to
..., in the same direction, fragments
...ugh this portion the rock on the
...bedded compact gneiss, with two,
... together with a peculiar schistose
... mica is in small masses or isolated
... surfaces, remaining brilliant on
...ck is a schist, micaceous or chlor-
... perhaps wholly absent. North of
... crossing of two roads, is an out-
... hornblendic rock partially altered
...m that in the southerly outcrop,
... similar rock appears in quantity
... the Gulf road, and about S. 43°
... found in the soil. West of the
...uff of serpentine dipping south-
...op at Rosemont Station, where it
...int the rock resembles that of the
...unlike that of any other part of
...embles that near Radnor Station.
... of the Potsdam sandstone on the
...y, further than in his fifth group

Finding, as we do, as has been described by Mr. H. C. Lewis and myself, extensive deposits along the base of the South Valley Hill, not only of a remarkably white sand, but of large masses of compact sandstone, very closely resembling that of the North Valley Hill, and the same rock, much decomposed, being found in the valley south of the South Valley Hill, accompanied by iron ore as at other places, and finding it nowhere else in the very great exposure of the hydromica schist rock of the South Valley Hill, it would seem more likely to be the Potsdam found in the same position east of the Schuylkill than mere accidental beds of sandstone, intercalated in the schists just at those points.

A trap-dyke has been referred to as lying between the hydromica schists of the South Valley Hill and the rocks on the south of it. This is prominent from the Schuylkill for about three and one-half miles to the farm of Mr. Frank Fennimore, near Wayne Station. Here it appears to widen out, and perhaps to divide into two branches, one crossing the railroad and turnpike between Wayne and Eagle, and being very prominent south and southwest of Eagle store, with a strike approximating S. 60° W. and completely within the gneiss; the other branch, or a distinct dyke, accompanying the serpentine in a more nearly due west direction. A mile southeast of Berwyn, the latter can be seen almost if not quite in contact with the serpentine, the trap, however, being on the *south* of the serpentine. The same is true south of Paoli, except that the trap appears to be on the north side. Prof. Rogers, page 168, speaks of this trap as "occurring along and outside the northern edge of the serpentine, in a succession of narrow elongated dykes, ranging more N. E. and S. W. than the serpentine." These I have not examined, but such structure agrees precisely with what I have observed of the serpentine further east.

South of the serpentine, perhaps from a bed in the Radnor gneiss, occur in the fields, often abundantly, a white quartz, weathering yellow on the surface, except certain portions which remain white. The form of many of these seems to forbid the idea of mere accident, and to suggest that they may be due to the remains of organic material which have deoxidized the contained iron, and thus facilitated its removal.

Note on Damourite from Berks Co., Penna.—Mr. F. A. Genth, Jr., remarked that a short time ago Mr. H. W. Hollenbush, of

...imen of a shaly mineral having a ...rance, but which, when examined ... composition of a damourite or mica. ...'orges, Rockland Township, Berks ...t from Friedensburg, and occurs as ... light brown mineral with a more ...me has also sent it from a locality ...outh of Blandon; this specimen is ...mewhat silky lustre, H = 2 — 2.5. ...nooth, sometimes slightly greasy; ...ellar; translucent in thin fragments. ... specimen by Dr. Genth gave him:

	4.86
	9.53
	0.36
	2.94
	32.11
	tr.
	99.40

...e specimen from Rockland Forges, ...82, Na_2O — 0.36, which proves the ...a or muscovite.

...a grayish to reddish white opaque ...nd, and rounded grains of quartz in ...r having a somewhat conglomerate-...

... 28, 1880.

... Cave.—Dr. A. E. Foote gave a ...vern near Luray, Va. He gave a ...t region and described his visit to ...remarkably symmetrical white and ...xhibited. The rapid growth of the ...nd their enormous size, were men-...stalactites slightly resembling Flos-...hown that the curling and twisting ... the remarkably damp atmosphere ...rface of the stalactites and caused ...atural course. Over the surface of ...nces and even long lateral branches ...med.

...m.—Mr. Lewis reported two new ...'s quarry, Easton, where it occurs ...hmond coal-field, Chesterfield Co., ... and in snow-white masses in triassic

SEPTEMBER 27, 1880.

A New Locality for Sphene.—Dr. A. E. FOOTE described the new locality for sphene and associated minerals at Eganville, Renfrew Co., Canada. The sphene occurs in immense crystals, weighing from 20 to 80 lbs., in a vein of apatite 20 feet wide. Many other veins of smaller size occur in the same county.

The rock is principally Laurentian gneiss and granite. A solid mass of sphene, very highly cleavable ($5 \times 2 \times 2$ feet), was observed in the side of the vein. It yielded several hundred pounds of sphene. Close by it doubly-terminated crystals of scapolite, weighing over 50 lbs., and crystals of pyroxene, weighing from 12 to 30 lbs., were found. Phlogopite and zircons, some of them twinned, occur at the same locality. From the enormous size of all the crystals found in this county, it must rank as one of the most remarkable mineral localities known. When the vein, 20 feet wide, spoken of above, was discovered, a doubly-terminated crystal of apatite, weighing 500 lbs., and bright upon the surface and ends, was said to have been found.

OCTOBER 25, 1880.

A New Locality for Hyalite.—Mr. H. C. LEWIS reported that he had found hyalite forming green, glassy coatings on hornblendic gneiss at a quarry on Mill Street, Germantown. The mineral has the usual mammillary or botryoidal surface, is perfectly transparent, and has a beautiful light green color. The color is due to the presence of copper, as shown by blowpipe tests.

Note on Autunite.—Mr. H. C. LEWIS remarked that he had recently investigated the optical character of the Fairmount autunite. His examination confirmed the orthorhombic character of autunite. The bissectrix is normal to the main cleavage-plane, and parallel to the secondary diagonal planes. The optic axial divergence is 24°. The autunite from Limoges, France, has an optic axial divergence of about 38°.

DECEMBER 27, 1880.

Crystalline Cavities in Agate.—Mr. THEO. D. RAND exhibited three specimens of agate, locality unknown, in the centre of each of which was a cavity with plane sides, and casts of these cavities showing them to have been calcite crystals. The method of taking these casts, the sides of the cavities being rough with re-entering angles, was explained. A solution of glue, with about one-fifth of glycerine, of such consistence as to form a thick, firm jelly when cold, but to be perfectly fluid when hot, was prepared and heated. The specimen was then cooled to about 32°; a rough splinter of wood was inserted in the cavity which was previously moistened with cold water. A drop or two of the glue solution

[illegible] allowed to become firm. The wood [illegible] il the glue was detached from the [illegible] removed the splinter marked so as [illegible] sition. More glue was then poured [illegible] d. A mould was then made of the [illegible] type-metal casts obtained.

[illegible] ARY 24, 1881.

[illegible] . LEWIS described two localities of [illegible] hood of Philadelphia, and exhibited [illegible] incrustations on hornblendic gneiss [illegible] awberry Mansion, Fairmount Park, [illegible] florescence at the West Jersey marl- [illegible] lphatite and melanterite.

[illegible] *on.*—Dr. A. E. FOOTE recorded the [illegible] tals of zircon, near Eganville, Renfrew [illegible] ed small but imperfect twin crystals [illegible] t sufficiently distinct to establish the [illegible] t that time. As in cassiterite and [illegible] 1 — i. It is doubtful if twins of [illegible] fore.

[illegible] IL 25, 1881.

[illegible] *coming County, Pa.*—Mr. ABRAHAM [illegible] ervations on the rocks and drift of [illegible] cially of that portion in the vicinity [illegible] scribed the exposures on Lycoming [illegible] various theories proposed to explain [illegible]. He drew attention to the ridges of [illegible] coming Creek and on Hogelan's Run, [illegible] ed by glacial action. He had found [illegible] ornblendic gneiss with magnetite in [illegible] nd Tioga Counties, and hoped that [illegible] e of that region.

[illegible] *aminæ of Mica.*—Mr. THEO. D. RAND [illegible] uartz occurring between the laminæ [illegible] o., Va. Part of it was crystallized [illegible] t was in discs, one-tenth of an inch [illegible] h, with polarized light under the [illegible] cross which rotated as the analyzer [illegible] t these disks were much like those [illegible] r Co., Pa., hitherto undetermined, [illegible] tter, and that it was probable those [illegible] z.

On Two New Localities of Columbite.—Prof. H. CARVILL LEWIS announced two new localities for the rare mineral, Columbite. Only a single specimen of this mineral has been described from Pennsylvania. An imperfect crystal was found in Nivin's quarry, Chester County, by Mr. Tyson, and noticed by Dr. Genth in his Mineralogy of Pennsylvania (p. 137).

Attention is now drawn to a beautiful doubly-terminated crystal which was found at Mineral Hill, Delaware County, and which is now in the cabinet of W. S. Vaux, Esq. The crystal is black, with a slightly iridescent surface, and is of about seven-eighths of an inch in length and half an inch in width. The following planes are present and have been determined by a hand goniometer, viz.: the macropinakoids $i\ \bar{i}$, the brachypinakoids $i\ \breve{i}$, the prisms I, the brachydiagonal prisms $i\ \breve{3}$, the basal pinakoids O, the brachydomes, $2\ \breve{i}$, and the brachydiagonal pyramids $1\ \breve{3}$.

The second locality is the well-known Dixon's quarry, Delaware. There is a large fragment of a crystal in the collection of the Academy marked on the authority of T. Fisher as from this locality. The specimen weighs over half a pound. Its nature was determined by its physical and blowpipe characters.

The occurrence of columbite at these localities is of some geological interest in connection with the determination of the age of the formation containing it, since the associated minerals are similar to those at the columbite localities of Massachusetts and Connecticut.

On the Occurrence of Fahlunite near Philadelphia.—Prof. LEWIS stated that he had found Fahlunite at two localities in the belt of hornblendic gneiss which crosses the northern part of the city. This belt of hornblendic gneiss, especially at its exposures at Frankford and near Germantown, has already yielded many minerals of interest, but fahlunite has not hitherto been noticed in Pennsylvania.

Fahlunite occurs disseminated in irregular masses in orthoclase at McKinney's quarry, Rittenhouse Street, and at Nester & Shelmire's quarry, on Wayne Street, Germantown. Only one specimen was found at the latter place. At McKinney's quarry it occurs in small, pale green masses, somewhat after the manner of the apatite of that locality. It has a scaly structure and a felspathic cleavage. It has a hardness of about 2.5. Its color is pale apple-green, and when heated it turns dark gray. It fuses at 4.5 to a dark grayish green opaque glass. It is nearly insoluble in acids. A rough analysis, made by fusing the mineral with sodic carbonate, showed that it consisted principally of silica and alumina, while containing small quantities of iron and magnesia and traces of lime and soda. It contains 2.8 per cent. of water. Although less hydrous, it resembles the variety of fahlunite

… is perhaps intermediate in character
…
… collected have the aspect of pseudo-
… quently there is no distinct line of
… hlunite and the surrounding ortho-
… to the other. At the line of junction
… comes dull, while the fahlunite, which
… more central portions of the mass,
… a greenish orthoclase. These features
… presented to the Academy.

… Y 23, 1881.

… *ming County.*—Mr. ABRAHAM MEYER
… fossil iron ore in Lycoming County.
… Larry Creek formed veins having an
… ht occasionally being 4 feet thick.
… ned at a high angle (70°–80°) show
… es, while the more horizontal veins
… They yield 40 per cent. of metallic
… Geological Survey (Report F, p. 235)
… Nodules of ore from Beatty's Run
… of carbonate of iron.

… EMBER 26, 1881.

… *Dopplerite from a Peat-bed at Scran-*
… LEWIS called attention to a very
… tly found in a peat-bog at Scranton.
… w court-house at that place, below a
… uck," and fallen trees, at a depth of
… e, there occur veins of a black elastic
… excavated, was a stiff black jelly, but
… s brittle and nearly as hard as coal.
… s jet, having a brilliant lustre and a
… peat-bog in which this substance was
… formerly a swamp or lake, which has
… n of the town. The deposit of peat,
… 10 feet of rubbish, is over 15 feet in
… n well. Near the bottom of the peat,
… muck," the black jelly-like substance
… gular veins, sometimes nearly perpen-
… r portion of the peat, and these veins
… re stain to 2½ inches. Immediately
… rlying the whole peat-bog, is a deposit
… ." This peat-bog, therefore, like the
… hout the glaciated region, is of post-
…
… described was first received, last July,

it was soft, black and elastic, having a hardness of less than one, and being almost jelly-like in consistency. After partial drying it was nearly as elastic as india-rubber. When a very thin slice was cut by a knife and examined under the microscope, it appeared brownish red by transmitted light, and was nearly homogeneous in character. It was imbedded in and surrounded by peaty matter, the latter being filled with plant remains. Occasional oval seeds are imbedded both in the peat and in the jelly-like substance. After drying for three months in the air the mineral was found to have a hardness of 2.5, and to have become brittle. The dried substance has a brilliant resinous lustre and a conchoidal fracture. It has a specific gravity of about 1.036. It is jet-black in the mass, but its powder has a dark brown color. In the closed tube it yields water and abundance of brown oil and empyreumatic vapors. The air-dried substance burns with a yellow flame while held in the flame of a Bunsen burner. In its natural elastic state it burns slowly without giving a yellow flame. It does not dissolve in ether or alcohol, but is entirely dissolved by caustic potash; and from the dark brown solution thus formed may be precipitated in reddish brown flocculent masses by the addition of acid. The filtrate from this precipitate has a pale yellow color. These are the properties of humic acid, and it is probable that this substance is an acid hydrocarbon closely related to that acid.

It is evident that this substance is the direct result of the decomposition of the surrounding peat. It may be of quite recent formation. It is of special interest in that it appears to be an intermediate product between peat and true coal, and it illustrates one method of change from the former into the latter.

In many of its characters this substance closely resembles dopplerite. Dopplerite is a black jelly-like substance, occurring in the peat-beds of Austria and Switzerland. In its method of occurrence it is precisely similar to the Scranton mineral. On exposure it hardens to a hard jet-like substance, which, however, unlike the Scranton mineral, does not burn with a flame. Dopplerite has been regarded as a truly homogeneous peat, and has been shown to have the same composition as that substance. It has never been identified in America. Whether the mineral from Scranton is to be regarded as dopplerite can only be determined after analysis. It is worthy of careful examination.

[illegible]FEROUS GARNET.

[illegible] H. A. KELLER.

[illegible] horizontal rock-stratum, I found the [illegible] currence of what seemed at first sight [illegible] itself is a very much weathered mica [illegible] kness, which contains this often very [illegible] harder aggregations. The stratum [illegible] milky quartz, each about 2 inches in [illegible] ess decomposed crystals of a rhombic [illegible] dhere. These very hard crystals are [illegible] ith vitreous, sometimes metallic lustre, [illegible] the very characteristic reddish-brown [illegible]

[illegible] are therefore of two kinds: 1. The [illegible] regations found in the midst of the mica [illegible] ose granules of still unaltered garnet [illegible] iO_2. They are only imperfectly held [illegible] The hard, jet-black, sometimes partly [illegible] attached to the quartz lying above [illegible] ite. Their hardness is 7, sp. gr. 4.25, [illegible] re not magnetic, but possess a most [illegible] el to the dodecahedral faces. Their [illegible]

[illegible]	36.92
[illegible]	1.14
[illegible]	27.36
[illegible]	3.74
[illegible]	26.54
[illegible]	.33
[illegible]	2.76
[illegible]	1.66
	100.45

[illegible] nce under the microscope, shows that [illegible] ssemination of a Ti Fe mineral in the [illegible] of these crystals have from within [illegible] much so as to have often formed [illegible] nes small but well-crystallized sphenes, [illegible] sbestos, mica, quartz, and even pyrite.

Their outer shape has generally by transformation become partially lost in the surrounding hydromuscovite. The Ti has probably been furnished by the two quartz strata, as I have observed, only a few feet distant, many other pieces of quartz impregnated with the same black mineral, while the enveloping strata were perfectly free from it, or had it only partly remaining as the more insoluble FeS_2.

OCTOBER 24, 1881.

Pyrophyllite and Alunogen in Coal-mines.—Mr. ELI S. REINHOLD made the following communication:

About two years ago the writer discovered in the coal slates of the North Mahanoy colliery, near Mahanoy City, Schuylkill County, an interesting mineral which, in its determination, defied the ordinary tests based on physical characters. A chemical analysis by Dr. F. A. Genth proved it to be an interesting variety of pyrophyllite. His report to the American Philosophical Society gives the results of the analysis, together with information as to occurrence, etc.

Attention is here called to that report for two reasons: First, for the purpose of making a correction; and, second, for a possible connection between pyrophyllite and the recently discovered alunogen.

When the writer furnished Dr. Genth with information regarding the pyrophyllite, he stated that it was found in but *one vein, of only one mine.* He has since found it at four different collieries, and coming from, at least, three different coal-veins.

Alunogen.—In a valley extending northeast from Mahanoy City, a distance of about a mile, are a number of collieries. A stream of water flows through it, receiving the mine-water from several of these collieries. During heavy rains the stream overflows its banks and covers a large area with the sulphur-water. The writer noticed, last spring, after the water had subsided, a white mineral coating the surface recently inundated. This mineral proves to be alunogen. In this efflorescent form it has been more abundant this summer than before.

As foreign mineralogists have noted the occurrence of this mineral in the coal-slates of Bohemia, Bavaria and England, and as the same mineral is common in our own State, as an efflorescence where iron-sulphide comes in contact with clay, its discovery here in the anthracite coal region may be regarded quite natural rather than surprising. However, there is a hint at a different origin of the alunogen found here from that ordinarily given. Instead of it being the result of the sulphur contained in the mine-water uniting with the alumina of the slate, the writer is inclined to think that the latter constituent is furnished by the

[illegible] hyllite, which contains fully 27 per
[illegible] nion is based on two facts:
[illegible] e has become abundant has this efflor-
[illegible]
[illegible] e pyrophyllite is found, can traces be
[illegible]
[illegible] experiments that may throw further
[illegible] acts, as far as observed, point to this
[illegible] tofore credited to this locality. It
[illegible] mely limited list of minerals found in
[illegible]

[illegible] *in Cork.*—THEO. D. RAND announced
[illegible] cork, about one-third of a mile north-
[illegible] . R. R., Delaware Co., Pa., where it
[illegible] overlying the serpentine belt.

[illegible] *uacreptite.*—Mr. G. HOWARD PARKER
[illegible] r aquacreptite. He had found it as a
[illegible] ecomposed micaceous gneiss on Lans-
[illegible] est of Hestonville, Philadelphia.

[illegible] rof. LEWIS remarked that as bearing
[illegible] ptite, it was of interest to observe that
[illegible] ties where that mineral had been dis-
[illegible] it was different from that at either of
[illegible] acreptite was first found at Strode's
[illegible] Mr. Jefferis, as long ago as 1832. It
[illegible] eralogists under various names until
[illegible] d, in 1868, as a new mineral. At this,
[illegible] ccurred in serpentine. The second
[illegible] Montgomery County, was discovered
[illegible] d is mentioned in Dr. Genth's Report
[illegible] sylvania. It here occurs in a pocket
[illegible] ird locality, West Philadelphia, now
[illegible] occurs in gneiss.
[illegible] aquacreptite in these diverse rocks, it
[illegible] gin cannot be ascribed to any direct
[illegible] ays, it is in part mechanical.
[illegible] of bole, differing from other varieties
[illegible] ecrepitation which it undergoes when
[illegible] me ago the speaker had made some
[illegible] the cause of this remarkable decrepita-
[illegible] it was a purely mechanical action due
[illegible] hen the porous mineral is suddenly
[illegible] other liquid, the liquid enters its pores
[illegible] open. If, however, it is gradually
[illegible] d air is replaced slowly by liquid, no
[illegible] upon subsequent immersion. That no

chemical action takes place is shown by the fact that if, after the decrepitation of the mineral, the fragments are dried, these fragments will again decrepitate when immersed in liquid, and this operation can be repeated as long as any fragments of sufficient size remain. Decrepitation takes place, whatever liquid is used, varying in degree with the mobility of the liquid employed. While very energetic in boiling water, it takes place with great slowness in sweet oil. The decrepitation of the aquacreptite of the three different localities varies also with the density of the specimens. The West Philadelphia mineral decrepitates and gives out bubbles the most rapidly, and the Chester County mineral the most slowly of the three. In some of the Chester County specimens decrepitation takes place very slowly in cold water, being most slow in the most compact specimens. The aquacreptite from Marble Hall falls to the smallest fragments. The hardness varies in different specimens from the same locality, the most variable, being however, at the Chester County locality. In general, the aquacreptite of the three localities has the following hardness, viz.: Chester County, > 2; Marble Hall, $= 2$; W. Phila., < 2.

The emission of air-bubbles, and the phenomenon of decrepitation when immersed, may be observed in a less degree in several of the varieties of bole; and it is questionable whether a greater amount of a purely mechanical action entitles a substance of probably mechanical origin to a special mineralogical name.

Quartz Crystals from Newark, Del.—Mr. W. W. Jefferis stated that he had found a number of doubly-terminated quartz crystals lying loose in the soil at a new locality, near Newark, Delaware.

November 27, 1881.

Some Ochreous Deposits of Kentucky and Indiana.—Prof. R. B. Warder made the following communication:

At the village of Francisville, Boone Co., Ky., a ferruginous mass crops out in the road; and a specimen of it is herewith exhibited. It consists chiefly of sand, clay and ferric hydrate, with smaller quantities of manganese and lime. A few rods north of this outcrop are many drift pebbles and some boulders; but the largest grain of sand observed in the ochreous mass was less than four millimetres in diameter. The whole bed seems to consist of rather finely pulverized siliceous drift materials, cemented with a considerable amount of iron; it resembles bog iron ore in appearance, but it probably contains too small a percentage of iron to rank as an ore, and the bed is of very limited extent.

In the neighboring parts of Indiana, very similar deposits occur at several points in Dearborn, Ohio and Switzerland Counties,

[illegible] 2.[1] These outcrops resemble that at [illegible] character of the materials, but also in [illegible]on and in the character of the neigh- [illegible] most cases in the portions designated [illegible] 300 to 400 feet above the level of the [illegible]

[illegible] rises whether these various beds are of [illegible] they are detached remnants of exten- [illegible] across the area now occupied by the [illegible]

[illegible] may be compared with certain masses [illegible]y cemented with ferric oxide, which [illegible] of Philadelphia, and are known as [illegible]se beds (as I was told by Prof. H. C. [illegible] of the Delaware, at an elevation of at [illegible] river. The Bryn Mawr gravel, then, [illegible]osits described in this paper in the [illegible] materials, the topographical situation, [illegible]nce; but differs in containing much [illegible] cemented, and probably contains a less [illegible]

[illegible]ogists regard these scattered deposits of [illegible]ents of one extensive bed. Further [illegible] deposits described above, may yield an [illegible]nt geological history.

[illegible] *Canada.*—Dr. A. E. Foote called atten- [illegible] olive-green crystals which he had noticed [illegible]able white garnet found by him in Hull, [illegible]da. From the few tests he had applied [illegible], and had sent the material to Mr. E. [illegible]

[illegible] *Garnet.*—Mr. W. W. Jefferis exhibited [illegible]t, in which the smaller crystal fitted [illegible] the larger. The smaller crystal was of [illegible] be detached from the larger one, whose [illegible] seemed to complete. He had found it at [illegible], a locality which has furnished several [illegible] garnet, from one to three inches in [illegible]

[1] [illegible], pp. 419, 420.
[illegible], pp. 389 and 423.

DECEMBER 23, 1881.

ON DIORITE.

BY ELI S. REINHOLD.

Several years ago I received a box of minerals from Placer County, California, which contained a specimen marked "Hornblende," so peculiar in appearance, that I laid it aside for special examination.

I herewith send the specimen, which proved to be diorite, a rock of volcanic origin. The arrangement of the hornblende and feldspar is different from that of any trap-rocks of same composition in the Eastern States, with which I am familiar. The centre of each nodule is composed of crystalline granules of the two minerals, hornblende and feldspar; this is enveloped by a zone of clear white feldspar, followed by another of both minerals in which the crystals are radiately arranged, at least sufficiently so to make it apparent to the unassisted eye. Another band of feldspar, less pure, however, than the first, is followed by a zone of hornblende which shades off into the coarse, crystalline, granular matrix of hornblende and feldspar of no defined arrangement.

Not having access to any lithological collection, nor even to the books descriptive of all the varieties of greenstone, I may overestimate the interest of this California rock.

A description before me of a diorite found in the Island of Corsica, known as Napoleonite, answers to many points in this specimen. The nodular masses of the Corsican greenstone are described as globular, while in the California rock they are oblate-spheroidal. It would be a matter of interest to ascertain what member of the feldspar group is represented in this rock. All my books agree in assigning the mineral in diorite (generally) to the *triclinic* feldspars; but some give labradorite, others oligoclase and albite; while another author calls it a mixture of anorthite and albite. Either the feldspar in diorite from different localities varies, or else opinions in reference to it are very diverse.

Locality is marked on specimen label.

[illegible] *lanite.*—Dr. Isaac Lea presented a [illegible] zircon, in quartz rock, which he had [illegible] Chester County; this being a new [illegible]

[illegible] *pite.*—Mr. E. S. Reinhold presented [illegible] ch he had found at Mahanoy City. [illegible] rof. Lewis, and is now announced as [illegible]

NOTES ON THE GEOLOGY OF LOWER MERION AND VICINITY.

BY THEO. D. RAND.

Of much interest to those interested in mineralogy and geology in Philadelphia is the last volume, C^6, published by the Geological Survey, covering the geology of Philadelphia County, and of the southern parts of Montgomery and Bucks, by Chas. E. Hall, with a letter of transmittal by Prof. J. P. Lesley, but I think those acquainted with this region must regret that the publication was not delayed until the adjacent parts of Delaware County were examined, and until more time could be given to the work reported on, that it might be as near perfection as possible.

Mr. Hall's conclusions are at variance with all our preconceived opinions; but that is no reason for their rejection. If his data are correct, his conclusions seem almost necessarily to follow; but it is impossible for any one familiar with the district to examine the map and text without a feeling that longer study might have modified the author's views. All will agree with him as to the difficulties to be encountered; but this should have induced the greater care. In Mr. Hall's letter he states (p. xvii), "It has been my object to locate accurately the areas of the different belts of the metamorphosed rocks." And in Prof. Lesley's letter of transmittal (q. v), "Mr. Hall has not only studied every individual exposure at least once, and the more important ones repeatedly, but has obtained from them several thousand hand specimens."

If, as a test, we examine upon the map the serpentine outcrops, which are generally so easy of identification, we shall be disappointed. For instance, tracing the steatite belt westward from the soapstone quarries on the Schuylkill, the very distinct outcrop at the corner on Hagy's Ford road, at the road crossing, one mile from the Schuylkill, is wholly omitted. The outcrop on the Black Rock road is represented as extending of a width of about 200 feet for about 900 feet eastward of the old Gulf road, $1\frac{7}{8}$ miles from the Schuylkill, while it is, at that point, over 1000 feet in breadth, and extends, though probably narrowing rapidly, fully 2000 feet eastwardly. West of this road, its location on the map is southward of its true position. This portion of the belt is made to end a short distance east of the Roberts road; whereas, on that road, it appears in place, with the garnetiferous schists

most distinct outcrop of over a
d this it is not shown until the
Mawr, is reached, where a very
and 1500 feet long is delineated,
venue.
road can be followed by abundant
where the southward course of the
S. W., just north of which a very
side of the road.
railroad cut at Bryn Mawr, which
hists. I have searched in vain for
atitic or serpentine rocks in it.
Taking advantage of the fresh
ns below Penn Avenue about
400 feet, including a light-colored
right-colored decomposing schists
on, were unmistakably decomposed
lieve, therefore, that serpentine and
r near the surface.
erly belt, that north of Lafayette
as ending about 2000 feet west of
true, an apparent break in the belt
a fault, throwing the westerly con-
break is small, and the belt can be
agments to a point between 3000
, where another fault occurs (or a
hwestward) and an outcrop in place
mile from the Schuylkill. Thence,
pears continuous; whereas, at the
ap through which a stream passes,
he westerly continuation of the belt
hwardly more than its width, show-
uct scale, the echelon structure so
the syenite. The outcrop is repre-
old Gulf or Conshohocken road;
ragments, and one outcrop in place,
r at the crossing of a branch of Mill
and Shalliol, where a large distinct
nce it can be followed by surface
terly direction (S. 35° W.), than the

easterly part of the belt, (S. 40° to 50° W.), probably 1000 feet. About 250 feet northward from this, and eastward of its ending, is another outcrop of serpentinous rock (another instance of echelon structure?). About 1400 feet S. 60° W. is another outcrop, forming a distinct small hill not upon the map, and other minor outcrops further westward. The character of rock in the outcrops adjacent, north and south, above mentioned, is different in each. The southerly is talcose and chloritic, the northerly a hornblende-like rock altered into serpentine or some allied mineral.

The outcrop at Rosemont, Pennsylvania Railroad, from which much stone has been quarried, is not upon the map.

An outcrop of serpentine is delineated northeast of the crossing of the Gulf road and the Mattson's Ford road, or Township Line road, and (p. 3) located northwest of Mechanicsville.[1]

The rock at the point indicated on the map, which is within one-eighth of a mile southeast of Gulf Mills, and over one-half mile southwest of Mechanicsville, is altered hydromica schist. It bears a remarkable resemblance to the decomposed schists in the cut of the Pennsylvania Railroad at Bryn Mawr. There are outcrops of serpentine, one in place on the Gulf road, about 500 feet S. S. E. of the cross-roads; the other, fragments in the soil, about 700 feet southeast. There is also an outcrop of similar serpentine, with steatite, on the Mattson's Ford road, just east of the Delaware County line. This is not upon the map. These outcrops, and another westward, were described in the Proceedings Acad. Nat. Sci., 1878, page 402, as belonging to a then undescribed northerly belt.

Mr. Hall (page 89) connects that on the Gulf road with the great belt passing through Radnor and through Chester County. He evidently has not examined the westerly outcrops.

The limestone in Upper Merion, just north of Gulf Mills (the south end of the Gulf), interesting in connection with that a mile farther up the Valley, is not upon the map, nor the eurite and the garnetiferous schists southeast.

Turning to the text, we find it stated (page ix) that "The ser-

[1] On the map the name Mechanicsville appears to be given to the settlement at the south end of the Gulf, correctly Gulf Mills, which name it has borne for much over a century. Gulf Mills, on the map and in the text, is applied to McFarland's Mills at the north end of the Gulf. Mechanicsville is a small town, formerly known as Rebel Hill, in a gap over one-half mile south of the Gulf.

... instead of passing in a straight line ...and Chester Counties towards Mary- ...rd in a curve towards Chester, on the ...n line, but in a series of projections, ... saw, some of which reach Chester ...

...outcrops the precise meaning is not ...pon the map,[1] connecting the Schuyl- ...he westernmost outcrop on the Black ...l southwestwardly to Chester Creek, ...ok will be found three-quarters of a ...that on Darby Creek, one mile north- ...ester road, one-half mile northwest; ...own Square to Palmer's Mills, upon ... that at Blue Hill, upon it; that on ... from the Schuylkill, a quarter of a ...nni on Chester Creek, about a mile ...

...produce a line passing through the ...chuylkill to Rosemont, the Meadow ... upon it; that on Darby Creek, quar- ...est Chester road, less than a quarter ...er's Mills, one mile southeast; Blue ...smal Run, $1\frac{1}{4}$ miles southeast; Lenni, ...

...rimal * * * is not recognizable ...er, south of the south edge of the ...lley in the South Valley Hill."

... Montgomery County line, near the ...oup" (the South Valley Hill schists), ... schists."

... Conshohocken the Potsdam does not ...ests directly upon the Laurentian;" ...he sandstone and beds of sand, result- ..., flanking the Chester Valley on the ... C. Lewis, in the Proceedings of the ...he Acad. Nat. Sci., No. 1, page 93.

...ware County, by G. M. Hopkins & Co., of ...lieve to be the most accurate map of the

West of West Conshohocken, a rock wholly indistinguishable from the eurite of Barren Hill, which Mr. Hall considers proved to be Potsdam, *does* occur at several (at least three) localities, viz.: southeast of Mechanicsville, in Radnor just west of the county line, and at Wayne, P. R. R.

That the limestone rests directly upon the Laurentian is more than doubtful, for while they cannot be observed between the two adjacent outcrops near the river, yet if the lines of the two be prolonged, mica schists, garnetiferous mica schists, and the peculiar thin-bedded feldspathic gneiss with crystals of hornblende found south of the syenite between the serpentine and steatite, can be seen, having a breadth of probably over three hundred feet, within a thousand westward of the limestone exposure.

There are three facts tending to prove that Cream Valley on the south side of the South Valley Hill is, though very narrow, similar in structure to the Chester Valley :

I. The presence of limestone.

II. The existence of iron ores resembling those of the Potsdam.

III. The presence of eurite.

On page 27 the Manayunk mica schists and gneisses are stated to extend from the vicinity of Haddington on the south to Ardmore on the north.

There is no mention made of the porphyritic gneiss which begins eastwardly as a narrow belt at the Falls of Schuylkill, this rock by its superior hardness causing the "falls." It widens out westwardly until at the Pennsylvania Railroad it attains a width exceeding a mile, and occupies fully one-half the limits above quoted. It extends southward to Market Street; south of this I have not examined. It is too important a belt, not only in its extent, but also in its uniformity throughout its whole limits, to be ignored in a study of the region. The same may be said of the Frankford gneiss which appears to extend as a distinct and characteristic belt, but with a strike much more east and west than the other rocks, from Frankford to the Wissahickon.

That the syenite belt south of the South Valley Hill is an anticlinal seems beyond question. Now both on the north and south of it occur thin-bedded micaceous gneiss and hornblendic gneiss, succeeded by garnetiferous mica schist. In the syenite, or very close to it in the micaceous gneiss, both on the north and south occur beds of serpentine of almost identical appearance, and in

...lc and serpentine very similar in ...e anticlinal. So nearly vertical are ...ent argument can be derived from

...rite, almost undoubtedly Potsdam ...sts, limestone, trap, and then the

...g a line from Bryn Mawr northwest ...Radnor Township, Delaware County, ...east line, that is west of Mr. Hall's ...grees more northeast and southwest ... limestone outcrops in Cream Valley ...e outcrop, is given herewith. Out-...posed within little over a half mile of ...rite, and the southern steatite belt, ...ugh the characters of the rocks can ...udied in more distant outcrops, of

... Syenite.

...ALS

...ous

...ica

SOUTHWARD.

Thin bedded micaceous gneiss.

2′. Serpentine.

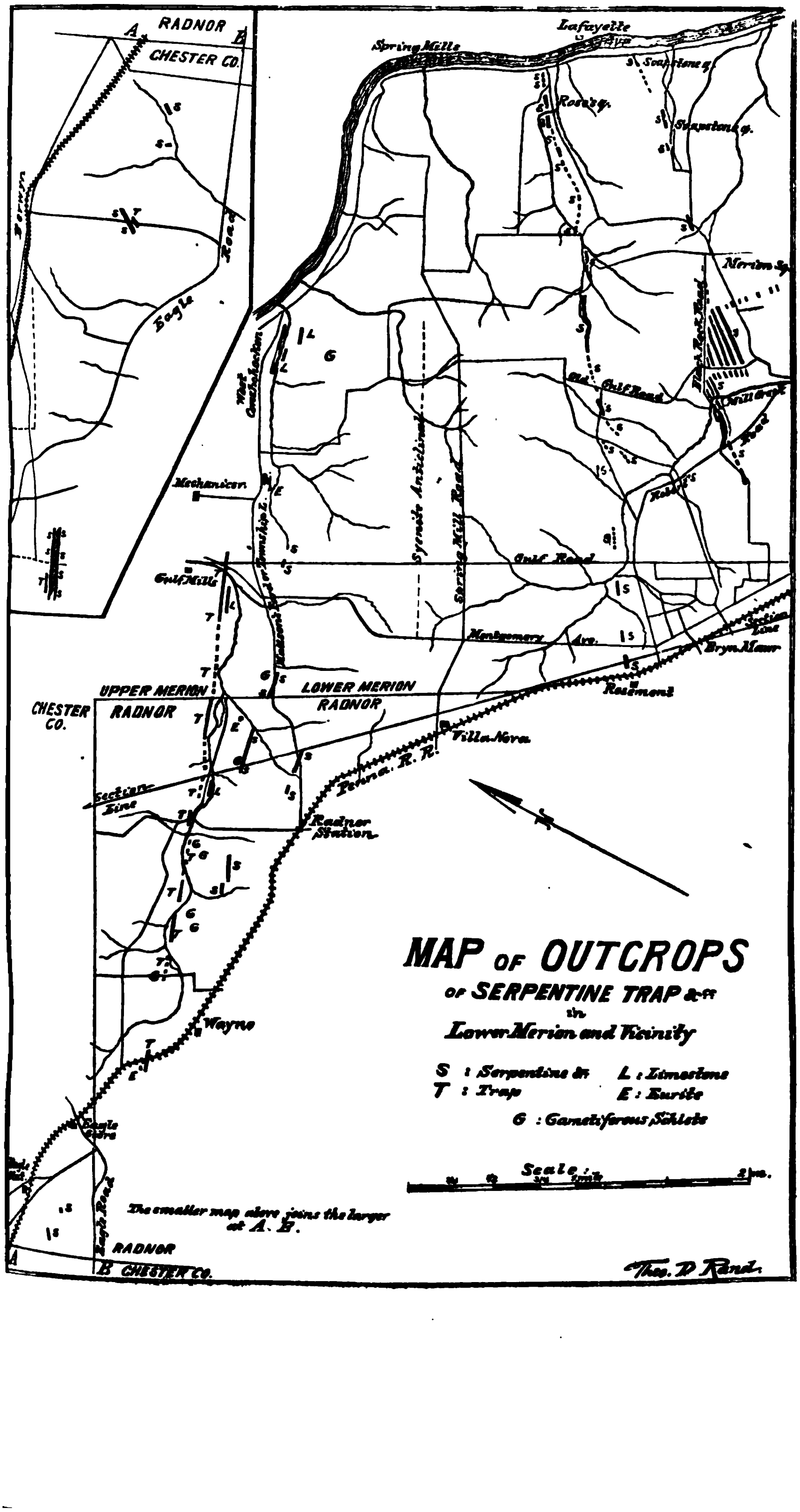
3′. Mica schist and thin-bedded gneiss with crystals of hornblende. Hornblendic gneiss.

4′. Steatite with serpentine.

5′. Garnetiferous mica schists.

...ecurs, if of 2 and 2′, 4 and 4′, each ...other, and 3 and 3′, 5 and 5′, are ...idence that the structure is a simple

... of the region showing most of the


MAP OF OUTCROPS
OF SERPENTINE TRAP &c
in
Lower Merion and Vicinity
S : Serpentine &c
L : Limestone
T : Trap
E : Eurite
G : Garnetiferous Schists
Scale
The smaller map above joins the larger at A. B.
Theo. D Rand
RADNOR
CHESTER CO.
UPPER MERION
LOWER MERION
RADNOR
CHESTER CO.
Spring Mills
Lafayette
Gulf Mills
Villa Nova
Radnor Station
Wayne
Bryn Mawr
Rosemont
Penna. R. R.
Section Line
Gulf Road
Montgomery Ave.
Spring Mill Road

... *Mineral.*—Prof. LEWIS reported that, ... amination of the black jelly-like sub- ... peat-bog, to which he had drawn atten- ... ting, he had found that it had characters ... y other mineral heretofore described. ... dard solution of alkali he had found that ... d was, therefore, to be regarded as an ... bly related to some of the varying forms ...

... kindly made by Mr. J. M. Stinson, ... le upon material which was carefully ... unding earthy matter, and which, before ... eat of 212° F.

	C	30.971
	H	5.526
or without ash,	O + N	63.503
		100.

... eld the empirical formula $C_{10}H_{22}O_{16}$. ... substance is remarkable for the low per- ... it contains.

... ite principally in its composition (dop- ... a C[illegible]$H_{10}O_{10}$), and also by its partial solu- ... burning with flame.

... iving this mineral a specific name, it is ... ogether, under one generic name, all those ... uced by vegetable decomposition which ...

... *e* (φυτον κόλλα), signifying *plant-jelly*, ... from Scranton, the dopplerite of Austria ... -like mineral from Finckenbach, St. Gall, ... as burning with a bright flame, and all ... origin. Each of the above minerals ... ified as varieties of phytocollite.

February 7.

The President, Dr. Leidy, in the chair.

Twenty-two persons present.

Filaria of the Black Bass.—Prof. Leidy stated that he had been told that the black bass, *Micropterus nigricans*, in some localities is much infested with a red thread worm. One procured in market a few days since for his table, was found to be greatly infested. The worms were coiled in oval masses from the size of a pea to that of a large bean, and were situated beneath the skin, in the muscles and under the membrane lining the abdomen. The worm is cylindrical, slightly narrowed and obtusely rounded at both ends, minutely annulate and otherwise smooth, pale red, bright red, or brownish red, translucent, with the darker red, or brownish intestine and the white œsophagus shining through. Mouth a small pore, unarmed; anus a transverse elliptical pore, terminal. Œsophagus long, capacious, cylindrical, straight or somewhat tortuous, slightly expanded below where it is constricted from the intestine, which is likewise expanded at the commencement, and ends in a short, more translucent rectum. Ovarium and ova indistinctly seen. Length from 3 to 6 inches by half a line in diameter.

The worm appears to be a Filaria, but the determination of the species was left for more extended observation.

February 14.

Mr. Meehan, Vice-President, in the chair.

Twenty-six persons present.

Sponges from the neighborhood of Boston.—Mr. E. Potts exhibited some fragments of fresh-water sponges collected in the Cochituate Aqueduct and sent to him by the Superintendent of the Boston Water Works. Alluding to the deleterious effects recently attributed to this sponge, as the cause of the pollution of the Boston water-supply, he said he was not prepared either to affirm or deny it. While he was well aware that a decaying fresh-water sponge was one of the foulest things in nature, in his own experience he had never met with it in sufficient quantities, locally, to suppose it capable of tainting, in its decay, millions of gallons of water, as now represented.

An examination of the sponge as to its specific relations, revealed some peculiar facts. Primarily it was evident that the sponge was

… ce of two or more species being very

… anching finger-like processes, smooth
… ance of dermal or flesh spiculæ, while
… spheres retained few if any acerate
… close resemblance to the description
… given by Dr. Bowerbank from speci-
… or a neighboring locality before 1863.
… another, probably altogether sessile,
… e of stout fusiform acerate skeleton
… coarsely spined, except near the ex-
… acute; dermal spicules absent or un-
… thout granular coating, some of them
… irregular, or malformed birotulate
… feature of which is the prolongation
… e outer surface of each rotule into a
… with, and a continuation of the shaft.
… ies, provisionally, the name *Meyenia*

… eferred to above, as marking this collec-
… he fact that all the statospheres, whether
… *gilla* or *Meyenia*, were *smooth*, that is
… llular "crust;" *second*, the apparent
… in both and the abnormal character of
… ospheres. The appearance is not infre-
… nown, heretofore been limited to the
… urrence of the same feature in the
… oupled with the fact that many of the
… heres, were imperfect, the rays being
… oximating their shape to that of the
… *Spongilla*, gave rise to the suggestion
… n, not merely a mechanical mixture by
… species, but an organic hybridization
… ogether of the amœboid particles of
… posed, or even by a fertilization of the
… zoids of the other.
… of the probability that such hybridiza-
… dduced, and the further discussion of
… n examination of the living sponge in
… ments upon those germinated in con-

… that the specimens received were col-
… e sarcode matter had nearly all been
… , accompanying changes in the pres-
… aller spiculæ.

FEBRUARY 21.

The President, Dr. LEIDY, in the chair.

Twenty-five persons present.

The deaths of John W. Draper and Theo. Schwann, correspondents, were announced.

The death of Robert Bridges, M. D., having been announced, Dr. W. S. W. Ruschenberger was appointed to prepare a biographical notice for publication in the Proceedings.

FEBRUARY 28.

The President, Dr. LEIDY, in the chair.

Thirty persons present.

On Tourmalines.—Prof. LEIDY said, in absence of other matters of more importance, he would exhibit a collection of tourmalines which belonged to him, and which he thought from their variety would interest the members. He remarked that while black tourmalines are the most common, white ones are rarest. Recently, good-sized crystals of the latter had been found at De Kalb, St. Lawrence Co., New York. From a broken crystal he had obtained a fragment, from which the beautiful gem presented was cut. This is of brilliant form, highly lustrous, transparent, flawless, and nearly colorless, or with only the faintest yellowish tint, like that of a so-called "off-color" diamond; and weighs 398 millegrammes. Some remarkable black tourmalines were brought to this city, a couple of years ago, by Lieut. Wm. A. Mintzer, U. S. N., who obtained them at Niantilik, Cumberland Gulf, Arctic America. They are generally three- or six-sided crystals, with a single three- or six-sided pyramidal termination, of various sizes. A large one in Prof. Leidy's possession is thirteen inches long and one and three-quarter inches at the pyramidal extremity. Perhaps the most beautiful black tourmalines, recently discovered in abundance, are those of Pierrepont, St. Lawrence Co., N. Y. They are remarkable for their perfection; occurring as doubly-terminated crystals, of large size and brilliant lustre. Fine brown tourmalines, often of large size and frequently doubly terminated, with one extremity much modified from the usual form, have also been found in abundance in late years, at Gouverneur, St. Lawrence Co., N. Y. It may be said that this State is pre-eminent for the beauty of its black, white, and brown tourmalines.

colored tourmalines, other than the
he Urals, Ceylon, Elba, Brazil and
those from the latter two localities
crystals of the same ordinary tourma-
green color and garnet red-axis, and
the prism colored pink and green, of
sometimes as delicate as that usual in
times as deep and bright as that of the
of Brazil. The Maine tourmalines
of shades of green and red, ranging
e transparent colorless variety called
finest achroites seen by Prof. Leidy,
Mt. Mica locality.
lines in the collection, chiefly obtained
Bangor, the following were especially

crystal with one end flat, the other a
hes long, and ten lines wide. One
end is green, dark and nearly opaque
sparent apple-green; the other half is
has a garnet-red axis towards the flat
k towards the middle of the crystal.
to five fragments, a condition quite
e tourmalines, and supposed to be due
. Two fragments of a crystal, an inch
a bright, rose-topaz color, becoming
nding in an apple-green plate, forming
ystal. 3. A fragment of a three-sided
an inch and a half wide, consisting of
ne end covered with Cookeite. 4. A
stal with trilateral pyramid, an inch
three-fourths of an inch in diameter.
a spherical nodule of achroite, from
em, of brilliant form, flawless, perfectly
400 millegrammes. It is nearly color-
hue.
rmalines were the following:
crystal, with pyramidal termination,
sparent and flawless. It was originally
g, and is eight lines wide. From its
cut, weighing 5980 millegrammes.
ls with pyramidal termination, one
d; the other of the same color at the
ed crystals with flat termination, green
axis. One an inch and a half long,
thick; the other an inch and a quarter
4. A rubellite of garnet-red color; a
ramidal termination, an inch long, and

Brilliant cut specimens of rose-red tourmaline from Maine and Brazil were alike in color. An Elba tourmaline about an inch in length was six-sided with a three-sided pyramid. The base is yellowish green; the upper extremity pale pink. A Ural rubellite, garnet-red, was six-sided with a six-sided pyramid.

Frank E. P. Lynde was elected a member.

Robert Hartmann, of Berlin; W. Kowalewsky, of Moscow, and K. Martin, of Leiden, were elected correspondents.

The following was ordered to be printed:—

[illegible] FOUND IN THE UNITED STATES.

[illegible] DR. L. T. DAY.

[illegible] ed myself exclusively to the descrip- [illegible] the United States.

[illegible] ve left out entirely, for the following [illegible] on Osten Sacken's valuable catalogue [illegible] he says: "The label in Macquart's [illegible] collection bears *America*, with a [illegible] in the Dipt. Exot. I doubt that this [illegible]" Of the Canadian species *O.* (*Strat-* [illegible] nd *O. inequalis* Loew, Hudson Bay [illegible] een identified; probably the former [illegible] can species none have been identified. [illegible] nd *O. scalaris* Loew are marked as [illegible] n the Encycl. Method, viii, gives the [illegible] s, which I insert in the original, as [illegible] me:

[illegible] ngueur de la tête, filiformes, termineès [illegible] resqu'égaux.

[illegible] courbée sendue et renflée a son ex- [illegible]

[illegible] supérieure courte, échancrée.

[illegible] culées, en masse.

[illegible] trale, petite, polygone.

[illegible] ve included only those species which [illegible] d in my collection. Those species of [illegible] nd of Say, Walker, Wiedemann and [illegible] he end of the descriptions represented [illegible]

[illegible] psis of Species.

[illegible] . . . . A.

[illegible] een markings, ... F.

[illegible] scent, ... B.

[illegible] e, ... C.

[illegible] below the base of the antennæ, *nigra*, sp. n.

[illegible] hout eminence. . *plebeja* Loew.

C. Face of male small, ... *flava* sp. n.
Face of male of usual size, ... D.
D. Femora black, ... *pilosus* sp. n.
Femora not black, ... E.
E. Second joint of antennæ shorter than the first, *pubescens*, sp. n.
Second joint as long or longer than first, *americana*, sp. n.
F. Dorsum of thorax with lateral stripes, ... H.
Dorsum with spots on the posterior angles, . . G.
G. Color markings luteous, . . . *microstoma* Loew.
Color markings greenish, ... *bicolor* sp. n.
H. Face with distinct black spots, . . . *Willistoni* sp. n.
Face without black spots, ... I.
I. Dorsum of thorax with two spots on the suture, *megacephala* Loew.
Dorsum of thorax without spots on the suture, *extremis* sp. n.

Odontomyia nigra sp. n. ♀

Black. Head black. Occipital disk black. Front shining black, in the central groove a stripe of a golden hue. Antennæ ferruginous red, the first two joints of nearly equal size, the third longer than both and tipped with brown or black. Face prominent, black, and sparsely pubescent with golden pile; a well-defined eminence is situated beneath the antennæ. Oral aperture small, proboscis black, so also labii and palpi. Thorax black, covered with golden pubescence. Scutellum concolorous, also clothed with the pile, the terminal bristles brownish yellow. Halteres green. Abdomen dark yellow; the median stripe black and forms a triangular spot in each segment, the base anterior. Venter brownish yellow. Legs luteous. Wings hyaline; third longitudinal vein simple; the discal cell emits two veins.

Long. corp. 4 lin., long. al. 3 lin.

Hab.—Kansas (E. W. Guild).

NOTE.—In one of the specimens the abdomen is black, with a feeble attempt at markings near the incisures by way of golden pile; the antennæ are black, and the terminal joints of the middle and posterior tarsi.

Odontomyia plebeja Loew. ♂ ♀.

♂. Black; the whole head concolorous; face not prominent, gently arched and clothed with golden yellow pile. Antennæ reddish at the base, the terminal joint being black. Thorax black

ow pubescence. Scutellum concolor-
sh. Halteres green. Abdomen green,
, extending almost to the posterior
t. Venter green, immaculate; legs
ue, the veins yellow, the third longi-
l emits two veins.

ular spots of subaureous tomentose.
th subaureous tomentose in place of
male.

l. 3 lin.

ass. (Williston); Conn. (Norton).

antennæ black. Face small, black,
borders of the mouth slightly reddish.
golden pile. Scutellum black, the
Halteres yellow. Abdomen yellow,
he yellow running in at the incisures,
drangular black spots in the segments.
legs yellowish; femora brown; tarsi
tibiæ with a solitary brownish ring.
third longitudinal simple, the discal
osterior being rudimentary.

l. 4 lin.

liston).

a single specimen, and the rudimentary
ell may not hold as a good character for

concolorous. Antennæ black. The
clothed with long yellowish pile.
k and also thickly clothed with the
minal spines of the scutellum yellow.
black, and sparsely clothed with the
triangular yellow spots running in
s. Venter yellow, with small brown
uated in the middle of each segment.
k, the under side covered with a thick
distal half of all the tibiæ black, the
ow; tips of tarsi black. Wings hya-

line, the veins reddish brown, third longitudinal simple, the discal cell emits two veins.

Long. corp. 6 lin., long. al. $4\frac{1}{2}$ lin.

Hab.—California (Baron).

Odontomyia pubescens sp. n. ♂ ♀

♀. Black. The whole head concolorous. Front sparsely golden pubescent. Antennæ black, the first joint longer than the second. Face prominent and covered with golden pubescence. Proboscis black. Thorax black, with golden pubescence. Scutellum black, also pubescent, the apical spines yellow. Halteres green. Abdomen black, with lateral transverse yellow stripes at the incisures. Venter yellow with irregular brownish spots. Legs brownish yellow. Wings hyaline, veins brownish yellow, third longitudinal vein simple, the discal cell emits two veins.

Long. corp. $4\frac{1}{2}$ lin., long. al. 4 lin.

Hab.—New York (Dr. Williston).

♂. Black. The face covered with a thick yellowish pile, as also the thorax; the apical spines of the scutellum yellow. Halteres yellow. The yellow spots at the incisures of the abdomen more prominent than in the female. Legs yellowish brown, femora tipped with black.

Hab.—California (Baron); New York.

NOTE. - In one of the male specimens the halteres are green, in another from the same locality yellow. I do not consider the change of color of any value; in the living specimens they were probably green.

Odontomyia americana sp. n. ♂.

Black. Head black. Antennæ reddish brown, the second joint as long or longer than the first. Face small, not prominent. Proboscis black. Thorax black and covered with a yellowish white pubescence. Scutellum the same, the apical spines being yellow. Halteres green. Abdomen green, with a median black stripe of nearly equal breadth throughout. Venter green, immaculate. Legs yellow. Wings hyaline, veins yellow, the third longitudinal simple, the discoidal cell emitting two veins.

Long. corp. 4 lin., long. al. 3 lin.

Hab.—Cal. (Baron).

Odontomyia microstoma Loew. ♀.

Black-yellow. Head yellow; occiput yellow. Front widens slightly anteriorly, about the centre or on either side is situated a

this it is clear, posterior sparsely
ack, and on each side is a brownish
ack; the first two joints cylindrical,
of the second darker; the third black,
pt prominent, moderately convex and
ile. Oral aperture small; proboscis
yellow.

ubaureous pubescent, posterior angles
y, the apical spines tipped with black.
he central black stripe is interrupted
Venter dilutely yellow, laterally with
rk yellow; posterior tarsi obscurely
yellowish, third longitudinal simple;
veins.

d. 4 lin.

Williston).

nts of the third joint of the antennæ in this
c style, as may be shown; the antennæ of
of *Clitellaria*, but the downward course of
rates its place in the Odontomyiæ."—LOEW.

, yellowish green. Occiput yellowish
brown, the terminal segment of the
ck. Face prominent, green, sparsely
Proboscis brownish black. Thorax
yellow, the lateral borders clothed
green and clothed with yellow pile.
bordered with yellow; the apical
black. Halteres green. Abdomen
ck irregular stripe. Venter green,
, the femora being yellowish towards
Wings hyaline, veins brownish, the
the discal cell emits three veins.

l. 4½ lin.

put green. Front broad, green, with
ch side near the orbit, also a central
the ocellar triangle. Antennæ black.
with an irregular black spot on each

side extending from the base of the antennæ downward. Proboscis black. Thorax black, sparsely pubescent, bordered laterally with yellowish green, extending to the posterior angles. Pleuræ yellowish green, with a central narrow black stripe extending to beneath the halteres. Scutellum green, apical spines yellowish. Halteres green. Abdomen green, with a central black irregular stripe, which terminates in the middle of the last segment. Legs yellowish, concolorous. Wings hyaline, veins yellow, the third longitudinal simple; the discal cell emits three veins.

Long. corp. 4 lin., long. al. 3 lin.

Hab.—New York (Dr. Williston).

The above species is respectfully dedicated to Dr. S. W. Williston, to whom I am greatly indebted for the use of his extensive collections in the preparation of this paper.

Odontomyia megacephala Loew. ♂ ♀

♂. Black-green. Head and occiput yellowish green; the head very large. Antennæ reddish, the terminal joint being almost black. Face yellowish green, immaculate, not prominent, receding towards the oral aperture. Proboscis black. Thorax black, pubescent with yellow, the lateral borders and posterior angles green; there is also a greenish spot on each side of the thorax near the median line crossing the transverse suture. Pleuræ green, clothed with yellowish pile. Scutellum yellowish green; the apical spines yellow, tipped with black. Halteres green. Abdomen green, with a black median stripe; the posterior half of the terminal segment green. Venter wholly green. Legs reddish; the anterior and middle tibiæ markedly tipped with black, the posterior obscurely so; all the tarsi tipped with black. Wings hyaline; veins yellow; third longitudinal simple; the discoidal cell emits three valid veins.

Long. corp. 5½ lin.; long. al. 4 lin.

♀. Green. Head and occiput green. Front green, widening anteriorly with two well-marked transverse black stripes, the superior being the broader, extending from orbit to orbit just beneath the ocellar triangle; the lower extends irregularly transverse across the whole front a short distance above the base of the antennæ. Antennæ reddish brown, the third joint tipped with black.

Long. corp. 7 lin., long. al. 5 lin.

Hab.—Kansas (Guild); Cal. (Baron).

d occiput green. Front green; on
he ocellar triangle and the base of
d black spot. Antennæ brownish;
hird joint black. Face green, prom-
Thorax black, subaureous tomen-
green, extending to the posterior
apical spines yellow. Halteres green.
al black stripe widening posteriorly;
nds quite to the lateral borders. Legs
ish. Wings hyaline; veins yellow;
the discal cell emits three veins.
om the females is that the male

$4\frac{1}{2}$ lin.

).

but differing in the abdominal markings

ent. x, 4.

except orbit, vertex, unequal band
næ, dorsum of thorax and abdomen
median line of the abdomen almost
low. Legs luteous; two submarginal

l. $4\frac{1}{4}$–$4\frac{1}{3}$ lin.

obtuse, immaculate. Occiput, except
hird of the front black; in posterior
dots; in front the unequal black band
large spots running into the sides.
h brown. Dorsum of thorax, except
angles, black, aureous tomentose,
clothed. Scutellum yellow; base
approximate, toward the apex black.
greenish yellow, in life without doubt
cond, third and fourth segments each
lar spot; or greenish yellow, concave
gle extending nearly to the middle of
lateral margins of the fifth segment
mearing black and more pronounced;
nter wholly yellowish green or green,

immaculate. Legs luteous; tarsi, from the apex of the first joint, brownish black. Wings pure hyaline; veins strongly ochreous; third longitudinal with branch; discal cell emits two veins.

Hab.—California (H. Edwards).

Odontomyia binotata Loew. ♂ Cent. vi, 22.

Green. Dorsum of the thorax, except the lateral borders and two disks, punctate; metanotum and abdominal stripes black; only one submarginal cell, five posterior.

Long. corp. $5\frac{1}{2}$ lin , long. al. $4\frac{1}{2}$ lin.

Vertical triangle black; base green; frontal triangle minute, black. First two joints of the antennæ cylindrical, subequal, of ferruginous red. Face totally green, not prominent, toward the oral aperture strongly receding. Keel moderately convex and obtuse. Proboscis pale; palpi concolorous, labelli black. Dorsum of thorax black; two small spots and lateral borders green. Pleuræ green; breast grayish black. Scutellum totally green; metanotum black. Abdomen green; the stripe towards the base of the first segment strongly dilated, in the second and third segments profoundly emarginated, and the two points in the angle of the fourth segment black. Venter wholly green. Legs ferruginous red; the first half of the femora and base of the tibiæ yellow; the apex of the anterior femora, the apex of the anterior tibiæ and all the tarsi black, but the posterior metatarsus except the apex and base of the anterior, ferruginous red. Wings purely hyaline; veins strongly ochreous; third longitudinal without branch; the discal cell emits three equal veins.

Hab.—Illinois (Le Baron).

Odontomyia lasiophthalma Loew. ♂. Cent. vi, 23.

Black, varied green, eyes strongly pilose, second joint of the antennæ half as short as the first. Legs luteous, femora except the apex black, one submarginal cell of the wings, five posterior.

Long. corp. $4\frac{1}{6}$ lin., long. al. $3\frac{1}{3}$ lin.

Head black; face concolorous, shortly conical, two transverse spots constituting narrowly interrupted bands, and two lesser at the anterior margin of the eye pale yellow. Eyes clothed with compact long hair. First two joints of the antennæ dark yellow, toward the apex obscure, the second one-half, and the last longer than the first; the third joint is wanting in this specimen. Dorsum of thorax with rough sub-luteous black hair, posterior angle yellowish green. Pleuræ concolorous, whitish hair, two spots of

... ones of a broken angular form, the ... ellum black, narrowly bordered with ... black, the whole margin and spots ... the second segment a spot large and ... the anterior margin: the third mod- ... fourth narrow. Venter wholly green. ... ous, femora except the apex black. ... ochreous, third longitudinal without ... s three equal veins.

... ersey.

... nt of the first joint of the antennæ being ... distinguishes between Stratiomyiæ and ... rmediate on account of the simple straight ... his genus to the Odontomyia rather than ...

... Cent. x, 6.

... othed, apex of femora and tibiæ, and ... aceous; second abdominal segment, ... argins near the border and all of the ... rant, extraordinarily prominent, first ... than the second, veins of the wings ... rior cells and two submarginal.

... d. 3½ lin.

... sh, short pubescent. Head concolor- ... he front and both margins testaceous. ... inent, protuberant, obtuse, lateral ... gly dilated. Proboscis black, stock ... ry thick. Antennæ drawn out, black, ... long as the second. Scutellum wholly ... s. Posterior margins of the second ... d fourth toward the side of the abdo- ... s three narrow bands are seen, broadly ... margin of the fifth segment wholly ... broad disk unequal and darkly lutes- ... re in living specimens I suspect to be ... apex of the femora, base and apex of ... ints of the tarsi except the apex fusco- ... aline, veins strongly brownish black, ... al subfuscous toward the apex, third ... branch, discoidal cell emits two veins.

Odontomyia nigrirostris Loew. ♂. Cent. vi, 19.

Black and yellow varied, scutellum without teeth, two submarginal cells. five posterior.

Long. corp. $5\frac{3}{5}$ lin., long. al. $4\frac{2}{5}$ lin.

Black and yellow varied, clothed with pale pubescence. Head yellow; lateral frontal stripes black, broad, abbreviated anteriorly, posteriorly with a black spot cohering with the vertex; a large black spot on the face. Antennæ black, first joint a little longer than the second. Proboscis wholly black, palpi concolorous. Dorsum of thorax black, margin of the posterior angles pale yellow. Pleuræ pale yellow, black maculated; breast black. Scutellum shortened, pale yellow, toward the base black. Abdomen broad, subplanum, black, from the angle of the first segment, a spot extends laterally from the anterior to the posterior margins, narrow in the third and fourth margins posteriorly and in the abdominal margin, all pale yellow. Venter wholly pale. Legs black, apex of all the femora, first half of anterior tibiæ and base of anterior and posterior tarsi dilute yellow or whitish. Wings pure hyaline, veins strongly ochreous, third longitudinal with branch, thus is made two marginal cells; discal cell emits three veins of which the one preceding the last is much shorter.

Hab.—North Wisconsin (Kennicot).

NOTE.—The number of posterior cells in distinguishing *Odontomyia* causes note, which is greatly relied upon; less is determined by making out the number of submarginal cells, in those species where there is only one submarginal cell, which does not happen rarely, as the third vein may be with a branch; or where two submarginal cells are found, this branch may be wanting.

Odontomyia pilimana Loew. ♂ ♀ Cent. vi, 27.

Black, antennæ red, dorsum of thorax in both sexes aureous tomentose, abdomen green, median stripe black, legs luteous, anterior and posterior tibiæ and metatarsus hairy beneath; four posterior cells, one submarginal.

♂. Thoracic pile shorter than in known species.

♀. Front near the ocelli luteous bipunctate.

Long. corp. 4–$4\frac{7}{12}$ lin., long. al. $3\frac{1}{12}$–$3\frac{5}{12}$ lin.

♂. Head black, face scattered with white hair, obtuse bicarinate, below the antennæ prominent, toward the oral aperture receding. Antennæ red, apex of third joint black. Proboscis thick, black. Thorax wholly black; dorsum more lutescent, thin in real male species and clothed with short aureous tomentose; pleuræ white

… teeth and apical margin greenish.
… ian stripe, moderately dilated poste-
… s; anterior and posterior tibiæ and
… with long pallid pile. Wings hyaline,
… ird longitudinal with branch, discal

… Front anterior to ocelli luteous bi-
… rnamented with an aureous tomentose
… the orbit aureous tomentose, below
… of thorax closely aureous tomentose,
… abdominal stripe in third and fourth
… in the male.

… Ent. vi. 21

… except the posterior angles, triangu-
… cutellum, and except the large lateral
… border of the fifth segment black.
… the femora and base of tibiæ yellow,
… rsi brownish black; two submarginal

… al. 3⅚ lin.
… *egacephala*, but the head is smaller
… on the abdomen. Vertical triangle
… frontal triangle minute black. First
… cylindrical, equal; the first brownish
… ous red; the third joint in this de-
… Face green, superior margin black,
… the oral aperture strongly receding,
… is dilute yellow, palpi concolorous,
… thorax black, posterior angles green.
… pot of the base broadly triangular.
… dilute subfuscous spot. Abdomen
… ment, a large lateral spot in the second
… anterior and posterior margins, sepa-
… gin by a black band, a lesser subrotund
… and the posterior and lateral borders
… Venter wholly green. Femora dilute
… rior, last third of middle, and apex of
… tibiæ ferruginous red; apical half of
… brownish black; tarsi brownish black;

first joint of posterior, except the apex, reddish, and base of the lowest anterior, brown. Wings pure hyaline, valid veins obscurely ochreous, third longitudinal with branch; the discal cell emits three equal veins.

Hab.—Carolina.

Odontomyia vertebrata Say.

♂. Mouth deep, black, pale within; hypostoma with an elevated testaceous knob; antennæ deep black, terminal joint beneath dusky, testaceous; thorax blackish, with hardly perceptible hairs; scutellum dull testaceous, black at base; tip a little hairy; spines horizontal, white; wings white; poisers white, with a whitish glaucous capitulum; feet yellowish white; abdomen subquadrate, much depressed, white; tergum with a series of large black spots almost connected together.

Length ♂ rather more than three-tenths of an inch.

Hab.—Northwest Territory.

Say, Complete Writ. i, 251; Long's Exped., App., 369. Wied. Auss. Zw. ii, 73, 20. Bellardi, Saggio, etc., i, 38.

Odontomyia Paron Walker. ♂ ♀.

♂. Body black; head as broad as the chest, clothed in front with short whitish hairs, red about the feelers; eyes reddish bronze; facets of the fore-part larger than those elsewhere; mouth black; feelers black, red at the base; chest and breast thickly clothed with tawny hairs; scutcheon armed with two tawny teeth; sides and under side of abdomen tawny, sometimes yellow and tinged with green; legs tawny; wings whitish; wing-ribs tawny; veins yellow; poisers tawny, with apple-green knobs.

♀. Head and chest bronzed; head black about the base of the feelers.

Length of body 3 lin., long. al. 6 lin.

Hab.—Trenton Falls.

Walker. Li·t iii, 536.

Odontomyia intermedia Wied. ♀.

Fühler schwarz, erstes Glied nur halb so lang als das dritte. Untergesicht schwarz, fast silberweisz behaart. Stirn mitten rostgelblich, an beiden Seiten schwarz, mit zwei fast silberschimmernden Flucken; am Scheitel erstreckt sich das Gelbe bis zu den Augen. Rückenschild schwarz, sehr kurz kiesgelb behaart; Brustseiten hingegen silberweisz behaart; Rand und Darmen des Schildchens gelblische. Hinterleib kaum weiszlich behaart; an

4 an jeden Seite ein linienartiger rost- breit unterbrochene Binde; der Hin- ittes überall lehmgelblich und mit nrandes zusammenfliesend. Bauch ; Rippe und die zweite Ader bis zur hmgelblich; das Randmal und die Adern rein braun; Schwingen schön Schenkel fast bis zur Spitze pech- ung.

ordamerika.

idula äuszert ähnlich. Fühlerwurzel verloren gegangen. Kopf schwarz. behaart. Rückenschild schwarz, mit seiten schwarz, schneeweisz behaart; hmgelb. Hinterleib papageigrün, mit Spitze jedes Abschnittes wenig ver- es letzten Abschnittes abgebrochener er Spitze jedes Abschnittes ein bräun- ter Fleck. Flügel sehr wasserklar, mit ger lehmgelb mit grünem Knopfe. meiner Sammlung.

vannah.

bbidentato nigra, abdomine maculis

dentes. Les antennes sont noires avec jaunes. La tête et le corcelet sont er duvet d'un gris un peu rousseâtre. é de deux petites épines rapprochées, L'abdomen est noirâtre en dessus, ches jaunes sur les côtés, triangulaires, saigu. Le dessous est d'un jaune un t noirs, avec l'extrémité jaune. Les nes. Les ailes sont transparentes, avec nes; elles sont courtes, et dépassent à

Elle se trouve dans la Carolina, d'où elle a été appartíe par M. Bose.

Encycl. Method, viii, 434, 13.

Odontomyia cincta Oliv.

O. scutello bidentato, viridis, thoracis dorso nigra, abdomine nigro, fasciis tribus interruptis, flavis.

Elle est presqu'aussi grande que l'odontomyie fourchue. Les antennes sont jaunâtres. Le tête est verte ou jaunâtre, avec trois points noirs sur le vertex. Le dos du corcelet est noirâtre. Les côtés et l'écusson sont verts ou jaunâtres; celui-ci est armé de deux petites épines. L'abdomen est noir en dessus, avec trois bandes interrompues et un peu amincies au milieu, d'un jaune plus ou moins vert. Le dessous du corps est jaune ou vert. Les pattes sont jaunes. Les ailes sont transparentes, avec les nervures jaunes.

Elle se trouve en Carolina; Illinois.

Encycl. Method, viii, 432, 3. Macquart, Dipt. Exot. i., 2, 189.

Odontomyia flavicornis Oliv.

O. scutello bidentato, nigra, capite scutelloque flavis, abdomine maculis lateralibus argenteis.

Ella a un peu plus de trois lignes de longueur. Les antennes sont jaunes, avec l'extrémité noire. La tête est jaune, avec les yeux noirs. Le corcelat est noir, avec quelques raies formées par un duvet argenté. L'écusson est grand, jaune, armé de deux fortes épines de la même couleur. L'abdomen est large, court, un peu aplati, noir, avec quatre taches de chaque côté, formées par un duvet argenté. Les pattes sont noires, avec les genoux et le premier article des tarses blanchâtres. Les ailes sont transparentes, avec les nervures d'un jaunne-brun. Les balanciers sont jaunes.

Elle se trouve dans l'Amerique septentrionale.

Encycl. Method, viii, 433, 9. Macquart, Hist. Nat. Dipt., i, 248, 4.

Odontomyia hieoroglyphica Oliv.

O. scutello mutico viridi, abdomine nigra, maculis lateralibus viridibus.

Elle est de la grandeur de l'odontomyie hydroléon. Les antennes sont noires. La tête est verte, marquée d'une tache noire, assez grande, à la partie antérieure; de deux autres un peu au dessus, sinueuses, et d'une triangulaire, anterieurement dentée, sur le vertex. Le corcelet est noirâtre avec le côtés et l'écusson verts; celui-ci est mutique ou armé de deux épines à peine appar-

…, avec trois petites taches verdâtres
…s. Le dessous du corps est vert ou
…es sont noires, avec l'extrémité jaune.
…jaunes, tachés de noir. Les ailes ont
…n-rousseatre, surtout vers le bord

…bia.

…a, abdomine fasciis tribus interruptis,

…l'odontomyie tigrine. Les antennes
…oire avec une petite tache oblongue,
…orcelet est noir, couvert d'un léger
…usson est de la même couleur, et est
…es jaunes. L'abdomen est noir, avec
…ôtés, d'une égale épaisseur, et une sur
… Les pattes sont jaunes, avec les
…noires. En dessous la poitrine est
…rdâtre. Les ailes sont transparentes,
…-rousseâtre.

…nigra, capite flavo punctato.
…e l'odontomyie tigrine. Les antennes
…'un jaune-obscur. La tête est noire,
…ord postérieur jaunes. Le corcelet est
…et d'un gris-rousseâtre. L'écusson est
…ulment quelques cils qui tiennent lieu
…ire avec un peu de jaune sur les côtés.
…uelques taches triangulaires peu appar-
…es par un léger duvet argenté. Le
…e verte à la base. Les cuisses sont
…unes. Les jambes et les tarses sont
…parentes, avec les nervures légérement

… Macquart, Dipt. Exot., i, 2, 189.

MARCH 7, 1882.

The President, Dr. LEIDY, in the chair.

Thirty-five persons present.

The death of Joseph Pancoast, M. D., was announced.

The Relation of Heat to the Sexes of Flowers.—Mr. THOMAS MEEHAN observed that the best fields for biological research were to be found amongst objects with which we have already a more or less familiar acquaintance. One fact observed will prove a stepping-stone to higher knowledge. His first new discoveries in *Acer dasycarpum*, the common silver maple of our streets, were communicated to the Academy and published in the Proceedings for 1868, and there had been interesting observations made on this species in the line of those discoveries on many occasions since that time. In that paper it was noted that the tree was not polygamous, as stated in the text-books, but strictly monœcious or diœcious. There were no hermaphrodite flowers, but each tree was either male or female, though occasionally the separate sexes were found on the same tree. The male flowers have no trace of a gynœcium, but the female flowers have well-formed anthers, but never have pollen, or even perfect themselves by lengthening filaments, as in the perfect male flower. Notwithstanding the perfect form of the anther, the stamens in the female are abortive. But the chief physiological fact of importance noted in the paper of 1868, was that a tree which for years would produce nothing but female flowers would sometimes change the sex, and bear only male flowers; while no instance could be found of a male tree eventually producing female-bearing branches. During the fourteen years since this discovery was recorded, Mr. Meehan said he had found frequent instances of change from female to male as at first observed, but not one instance of change from male to female. There could be no doubt of the order in which the sexual change occurred. While the maple was growing vigorously it followed the rule with all trees and made no attempt to flower. With some check to the vegetative force, the reproductive power asserted itself, and flowering began; this is the second stage. With a greater check to the vegetative force, only male flowers resulted. This was the third stage. Since that time he had shown to the Academy that when a maple-tree passed from the vegetative to the reproductive condition, and bore at once male flowers only, it was a leap down from the first to the third stage, missing the second or female—for he had found that though the amount of vital power exerted in the production of seeds, and the immense loss of leaves which the production of seed implied (as

...with the silver maple after bearing a ... female trees of the same age and under ... ere usually as large as the males which ... nutritive powers.

... to pause here a few minutes, while he ... nother matter which he had recently ... he Academy. It was in relation to the ... -buds. About the time of the fall of ... istinguish a flower-bud from a leaf-bud. ... ues to grow at a comparatively low ... af-bud remains stationary. Even when ... ral degrees below the freezing point, ... in size, though naturally much more ... ine. In the peach, the growth of the ... between 32° and 40° Fahr., until by ... reached often as much as three-fourths ... ch-bud will often have its flowers fully ... d has scarcely begun to grow. We learn ... s less heat to develop a flower-bud than a ... hese observations, he had been watch... ter the behavior of the buds on the ... anced gradually until, by February 23, ... nd—the leaf-buds remaining as they ... They had been expanding continu... ner or colder, up to the present date ... ing blossoms have been wholly male ... ted in the specimens exhibited, were the ... ible through the parting bud-scales. It ... ad reached another important stage in ... ple-tree. First, it requires less heat to ... ower-bud than a leaf-bud; secondly, it ... growth in the male flower than in the ...

... the female trees, Mr. Meehan noted ... of growth. Taking a twig of the last ... ring condition, one or two blossoms ... he leaf-bud, in trees of either sex. So far ... But in the female tree the central or ... to growth in the spring, made a shoot ... n length according to the vigor of the ... the male tree, on the contrary, the ... re than perhaps a quarter of an inch, ... es on the top of what was a head of ... e branches were reduced to mere spurs, ... le had measured these little branches ... aring male flowers for ten successive ... e than from three to five inches in ... an wheat straws. It was from these ... f opened flowers appeared. The male

flowers on the shoots of last year did not advance as did the flowers on the spurs. It is very important to note this fact. These are only now opening, and are cotemporaneous with the opening of the female flowers which, like them, are sparsely arranged around the axillary bud of the past season. The immense amount of pollen from the early flowers, forming the great bulk of all the pollen produced by the tree, is scattered before the female flowers open, and is absolutely useless for any purpose of fertilization, or useless for any purpose of individual benefit to the tree or to the race, so far as we can see. These later-opening flowers, formed on the wood of last year, are evidently the chief reliance, if not the only reliance, of the female flower for its reproductive energy.

Just here an objection may be raised. If it be heat alone which advances the male flowers on the spurs, why does it not advance them on the wood of last year? If it take less heat to bring forward a male flower than a female flower, why is not this power exhibited when the separate flowers happen to be on branches both apparently alike in vital conditions? Here we may return to the point we diverged from. We have seen that there are successive stages from a high vegetative, but unproductive condition, to one of fertility; and again one lower than this, lower in comparison with vegetative power, in which the purely male or sterile condition is reached. In other words, a highly vital condition is more closely allied with those attributes which characterize the female sex than with those characteristic of the male, and we may therefore reasonably look for some influence in the female direction on the male flower where these conditions exist. Therefore male flowers on a shoot characterized by a highly vitalized condition, would be likely to resist influences to which they would be otherwise subjected. In short a male flower on a strong branch ought not to yield as readily to the excitement of heat as one growing on a weak branch. At any rate the fact that the whole of the weak spurs of the maple-tree produce nothing but male flowers, and that these male flowers expand at a lower temperature than the females do, is conclusive as to the law, whatever answer the objection may receive.

This law, thus demonstrated, will be of great practical value to culturists. So far as the single point of the advancement of the flowers by a low temperature is concerned, the peach-grower will be interested in keeping the temperature cool so that there shall be no advance of the flower until the temperature is high enough to bring forth the leaf-buds as well. Now we can go further and understand why some amentaceous plants so often produce no fruit or imperfect seeds. It is well known that isolated trees of birch, though producing abundance of male and female flowers, very often have not a perfect seed. We may now see how the catkins may be brought forward by a low temperature not sufficient to excite the female flowers, and thus lead them to mature

the weather is warm enough to bring
n to receive the necessary pollination.
er is cool till the regular springtime
there is little very exciting warmth
e arrives, there is not likely to be so
opening of the male and the female
e with the common European hazel or
ntry, an examination to-day clearly
e attained their full length, and the
heir pollen with another day's sun,
f the little purple stigmas bursting
buds which form the female flowers.
their pollen to-morrow, as they doubt-
rises to 45°, there certainly can be no
tly no hazel-nuts from the trees in
a well-known fact that the European
r nuts in this part of Pennsylvania,
planation in the facts now developed.
such failures, the climate being prob-
rable to the simultaneous production

referred to the influence which these
stions of dichogamy. There need not
rule in the production of proterandrous
We might expect to find proterandry
nt in plants growing where there was
of warm and cool days, than in the
re the climate is not what is called
where the temperature was regularly
g season had arrived, in which case
ifference in time between the advance

e might be allowed to generalize from
ple-tree, the following principles seem

ar on female maple-trees till some of
exhausted.
ale flowers, have vital power sufficient

e flowers, have not vital power enough
ut remain as spurs, which ever after

ers only, are more excited by heat than
temperature under which the females

ed by cooler ones, will therefore make
in time between the opening of the
ers, and possibly in the proportionate
s and pistils in hermaphrodite flowers.

Professor HEILPRIN remarked that in the south of France there were often warm days in winter, much as we have here, but he believed there were no failures in the hazel-nut there.

Mr. Meehan said that when he used the word Europe, he had England in his mind, as his own personal experience was chiefly drawn from there. In that country, he believed, the catkins were never brought on by warm days in winter, so as to mature before there was warmth enough to develop the female flowers.

The President, Dr. JOSEPH LEIDY, inquired whether the American species (*Corylus Americana*) exhibited the same characteristics as the English species?

Mr. Meehan replied that he believed it would be found to do so, in some degree.

On Balanoglossus, etc.—Prof. LEIDY stated that in a recent trip to Atlantic City, he had observed the singular worm, *Balanoglossus aurantiacus*. It occurs in moderate number along the shore of a pond between the beach and the lighthouse. In the same position he had collected *Solen ensis*, specimens of which were presented this evening. As this occurred in considerable number, he had procured a sufficient quantity to try it as an article of food, and had found it to make excellent soup. In the vicinity he had picked up a number of specimens of *Actinia rapiformis*, which had been recently thrown upon the beach. On a former occasion, at Atlantic City, he had observed another Actinia, the *Bicidium parasiticum*, which is parasitic on the large jelly-fish, *Cyanea arctica*, so frequently thrown on shore during the summer.

Scolithus in Gravel.—Prof. LEIDY remarked, that since making the communication on some rock specimens, he had been led to suppose that if the quartzite pebbles of our gravels were largely derived from the Potsdam sandstone, the characteristic fossil, *Scolithus*, would be found as an occasional associate. With this view he had recently taken an opportunity of examining a gravel bank on the University ground, and had there picked up the three specimens exhibited, with well-marked *Scolithus*, which were broken from as many boulders. He also directed attention to specimens presented by Mr. John Ford. These consist of pebbles of a chalky white porous siliceous rock, with impressions of brachipod shells, which were picked up from the gravel of the reservoir at Fairmount Park.

MARCH 14.

The President, Dr. LEIDY, in the chair.

Twenty-three persons present.

...n and that of James Lanman Harmer,

...

...*monites in Deposits of Tertiary Age.*—
...N stated that he desired to place on
...e remains of ammonites in deposits of
...members of this group of cephalopod
...o have become extinct with the creta-
...o form having thus far been found
...ica, or in any other country whose
... up, that could with positiveness be
... the limits of this period. The speci-
...(now in the possession of the Academy)
...ck fragment belonging to the so-called
...n, California, a series of rock deposits
...Gabb and Prof. Whitney, of the Cali-
...he uppermost member of the cretaceous
...r. Heilprin stated that having recently
...study the fossil organisms contained in
...ypes of the collection (deposited in the
... form the basis of Gabb's important
...y of California, he had arrived at the
...alled cretaceous deposits were unques-
...hich had likewise been maintained for
.... Conrad, but which, in the absence of
...to have been subsequently abandoned.
...rked that, with the exception of one
...mmonite, there was, to his knowledge,
...retaceous type of organism to be found
... but, on the contrary, several genera,
...not known anywhere to have appeared
...e characteristic of these fragments.
...ntained a few species undistinguishable
...rtiary deposits of the eastern United
...tain remarks made by Dr. HORN, as to
...on occupied by the rocks whence the
...Prof. Heilprin stated that he was aware
...on had been described as lying conform-
...ut that stratigraphical position by itself
...mining the geological age of a horizon,
... facies of the contained organic remains.
...ic remains in tertiary strata need not
...ologist, since recently Prof. Waagen, of
...heir discovery in the carboniferous of
...n the geological scale than the deposits
...een supposed to characterize.

MARCH 21.

Mr. MEEHAN, Vice-President, in the chair.

Twenty-seven persons present.

On the Condylarthra.—Professor COPE made some observations on the characters of the newly-discovered group of Perissodactyle ungulates, which he had called the *Condylarthra*. He defined it as follows, comparing it with the typical *Perissodactyla*, which he referred to a suborder, under the name *Diplarthra:*

Astragalus with one uniformly convex distal articular face; humerus with epicondylar foramen. *Condylarthra.*

Astragalus with two truncate or concave distal articular facets for the cuboid and navicular bones; no epicondylar foramen of humerus. *Diplarthra.*

The *Condylarthra* have as yet been only found in lowest horizon of the Eocene period, the Puerco and Wasatch, and only on the North American Continent. Appropriately to this position in time, its structure indicates that it is the most primitive type of the order of the *Perissodactyla.* A number of genera and species belong to it, and these fall into two families, which are defined as below. They conform to the definitions of the order, in possessing an alternating arrangement of the carpal bones, and a third trochanter of the femur. The approximation to the *Hyracoidea* is greater than that of any group of the *Perissodactyla.* That order agrees with the *Condylarthra* in the simple articular extremity of the astragalus, which is, however, less convex; but it has a very peculiar articulation with the anterior face of the distal extremity of the fibula, seen in no other group of ungulates. In the manus the lunar bone is very peculiar, not being divided below into two facets as in other ungulates, and articulating with the carpals of the trapezoides series (the intercalare) as well as with the unciform. In these points the *Condylarthra* agree with other *Perissodactyla.* In *Hyrax* there is also no epicondylar foramen. The two families are defined as follows:

Dentition bunodont; toes 5–5; premolar teeth different from the molars above and below. *Phenacodontidæ.*

Dentition lophodont, with crescents and deep valleys; premolars partly like molars below; toes ? *Meniscotheriidæ.*

The bunodont dentition and five toes on all the feet, give the *Phenacodontidæ* the lowest place in the suborder and order, as the most generalized type known. The *Meniscotheriidæ* have a quite specialized dentition, and until I learned its condylarthrous character, I was at a loss to account for the presence of such perfection in so old a type. The number of the toes is yet unknown, but I suspect from the large size of those I have seen, that they

… the *Phenacodontidæ*. It appears to … and is a good illustration of Dr. … persistence of the "adaptive" over the … iculation. Kowalewsky observed that … have the carpo-metacarpal, and tarso- … ple and not alternating, have become … ersisted, the metapodials articulate … or tarsal series. The same rule has … ulates to the distal astragalar articu- … *Amblypoda*, with the double articu- … ts, while the *Condylarthra*, with the … ppeared without leaving a trace. The … same simple distal articulation, still … exception to this generalization. … tributed as follows:

… ACODONTIDÆ.	Puerco.	Wasatch.
…		1
…	2	8
…	1	
…	1	
…	3	
…	1	
…	3	
…	1	
… ISCOTHERIIDÆ.		
…	3	
	15	9

… *ntidæ* are distinguished as follows:

… premolars with an internal cusp.
… h two external cusps; inferior molars with … *Phenacodus.*
… nding faces; no cusps. *Anacodon.*
… th but one external cusp; inferior molars … *Protogonia.*
… g of an anterior *V* and a posterior longitu- … *Pantolambda.*
… with a high internal cingulum concentric … cusp.
… mediate tubercles; fourth premolars with …
… f the superior molars not cut off; several … internal cingulum. *Catathlæus.*
… nediate tubercles forming branches of a *V* … ; posterior inner distinct and cut off by a … rs without inner cusps; first inferior true …
… th elevated internal crest. *Anisonchus.*
… cone without inner crest. *Haploconus.*
… ; inferior true molars with anterior lobe; … heel instead of opposite tubercles.
… nferior molars forming a cutting edge. *Periptychus.*

The only genus of the above, in which the structure of the feet is well known, is *Phenacodus*. It is partially known in *Catathlæus*.

The only genus of *Meniscotheriidæ* is distinguished as follows:

Inferior premolars consisting of two *Vs*. *Meniscotherium*.

Variation in the Nest Forms of the Furrow Spider, Epeira strix.—Rev. Dr. H. C. McCook remarked that he had observed that some of the orbweaving spiders had a marked tendency to vary the forms of their nests. The spinning work of spiders may be classified as (1), the *snare*, spun for the capture of prey; (2), the *enswathment*, by which insects are disarmed and prepared for food; (3), the *gossamer*, used for purposes of aqueous or aerial locomotion; (4), the *cocoon*, spun for the propagation and protection of the species; and (5), the *nest*, which is a domicile more or less elaborate and permanent, within or under which the aranead dwells for protection against enemies and weather changes. As a rule, the great groups of Orbweavers differ from each other and agree within themselves in the characteristic form of nest. The form prevailing in each family is substantially the same; each species appears to adhere quite steadily to one characteristic form; but there are some marked variations in the habit of certain species, the most decided of which have been observed in the case of *Epeira strix*. Some examples of this were given.

1. The ordinary nest of Strix when domiciled in the open field or wood, is a rolled leaf. A single leaf is taken, the edge pulled up, drawn under and fastened by adhesive threads into a rude cylinder, within which the spider hides during the day-time. A thread connection with the foundation lines of the snare is maintained; but rarely with the centre of the orb by a taut trapline as is the habit of the Insular spider, *Epeira insularis*.

2. A second form of nest varies from the rolled leaf nest, in having the edges of two adjacent leaves bent towards each other and lashed together on the exterior at the juncture by silken cords, and on the interior by adhesive tissue-web. An oval opening is left at the united points of the leaves, through which the connecting line passes to the snare. The spider domiciles within the leafy cavern thus formed.

3. Again, the spider avails herself of small holes in wood or stone, openings in fences, the interspace between curled bark on the trunk of old trees, or some like cavity, which she appropriates as a nesting-place. A slight lining will generally be found upon the concave surface. Dr. McCook had noticed that in such cases the snare is sometimes diverted from its normal shape in order to give a covenient approach thereto from the den. One such example was found spun between a side of the Peace Fountain in Fairmount Park (Philadelphia) and the stone wall adjoining.

within a hole in the rock, the spider
m the plane of the orb and extended
The spirals which passed over this
or angle, which was indeed nearly a
b an odd, broken appearance. The
he bridge-line by which Strix passed

due to an accident in the environment
trix had woven a snare in the hollow
isbon, Ohio), within two feet of the
ennsylvania carpenter ant (*Campo-*
uarters in the tree, a squad of black
ing their wooden galleries. These
openings just above the spider's orb,
goodly quantities of the brown saw-
all of chippings as big as a walnut
s had been purposely massed by the
be, the ball was utilized as a nest; its
spherical cavity formed by silk-lining
red by a circular door bound around
This quaint domicile was pendant
er foundation lines, and herein Strix
rpenters worked away above her, con-
n the roof of her den, and the orb
e snare was quite covered with them.
the nest, as well as its form was excep-
rix is well nigh invariably beyond the
, indeed, several feet. In these points
d to an intelligent variation of her
ces.
ather a series of variations, was noted
Mountain at Bellwood, Pennsylvania.
d been cut away and tossed from the
e Juniata River below. The foliage
the boughs, whose branches stretched
ng them a colony of young furrow
tents and spread their snares. One
er web near the axil of several goodly
formed into a natural shelter by the
gh. The spider had recognized this
the point of juncture, or rather took
very little artificial nesting beyond a
bark at the point where she sat.
dged at a point near the tip of a small
twigs gave no sufficient shelter, and
d. Accordingly a silken tube, funnel-
the twigs, within which young Strix

A third spider lodged in a similar site, had made a silken sack for a tent, whose mouth had apparently originally opened directly toward the snare. But a saltigrade spider had fastened a parasitic tubular nest upon one side of this sack, and accordingly the mouth was found closed and the door shifted to the opposite side, as though to avoid interference with a troublesome neighbor.

A fourth individual had woven a simple silken cover or screen, behind which she lodged. A fifth had pitched her tent upon a stray leaf beneath which a similar cover, a small rectangular piece of silk canvas (suggestive of the military bivouac or "dog tent") was stretched by lines attached to the sides and corners, and fastened to the leaf surfaces and surroundings. Between this sheet and the leaf the spider was ensconced having the usual bridge-line connection with the orb.

6. Two of the above colony had established nests in tufts of a parasitic moss fastened upon the dead limbs. One of these was very pretty and ingenious. The moss grew in a bunch about the size of a hickory-nut; this was pierced at the top, and the filaments pushed aside sufficiently to allow an interior cavity large enough to house a spider. An oval door or opening was formed near the top by bending and binding back the fibres of the plant. A secure and tasteful retreat was thus obtained at the only really available spot in the vicinity of the snare.

7. When the furrow spider weaves her orb upon the exposed surfaces of human habitations, as the cornices of porches, out-houses, etc., her nest takes a form quite different from any of the above. A tube of stiff silken fibre is spun against the surface to which it is lashed at all sides. This cylinder is about an inch long and half-an-inch thick, and at the end toward the orb has a circular opening about a quarter of an inch in diameter. The stiff texture of the nest appears to be necessary to make the walls self-supporting, inasmuch as there are no supports like the twigs and leaves found at hand in arboreal sites. Moreover, the open position of the domicile exposes the spider very freely to the assaults of the mud-daubers who frequent such localities, to birds and other enemies, so that a canvas is needed of tougher texture than that required in sheltered sites. It may be remarked that in old buildings, which present cracks and crannies convenient for nesting, woven nests of this sort will rarely be found.

It is thus seen that while there is a general regard to protection of the spider's person, there is a modification over a quite wide degree of variation in the form of the protective nest. Further, that this modification appears to be regulated more or less, by the accidental environment of the domicile, and in such wise as to show no small degree of intelligence in adapting the ordinary spinning habit to various circumstances, and to economizing labor and material.

MARCH 28.

...ent, Dr. LEIDY, in the chair.

...sent.

...enderdine, M. D., and that of Solomon W.
...announced.

...e offered the following, which was adopted
...d :—

...learned with deep regret of the death of
... curator, Robert S. Kenderdine, M. D.,
...n record the regret we feel in thus having
...services as an officer and his agreeable
...a regret increased by our recollection of
...eartedness which always characterized his
...refore

...ing the loss which has been sustained, we
...sincere sympathy in this hour of affliction.

...y of these resolutions, signed by the Presi-
...cretary, be forwarded to his family and
... full upon the minutes and published in

...f the By-Laws, was amended by striking
...r the word "meetings" in the third line,
... like approval may change the same."

...n, M. D., Eugene M. Aaron, and John
...bers.

...y for *Helvite*.—Prof. H. CARVILL LEWIS
... some minerals which he had recently
...mine near Amelia Court House, Virginia,
...known for its microlite and other rare
...crystalline substance, which upon exam-
...*Helvite*. The mineral occurs in crystals
...asses imbedded in bluish white orthoclase,
...ted with pale red topazolite. While no
...ficiently perfect to allow of measurement,
...tion upon polarized light proved their

...rdness of about 6, a specific gravity of
...color, a somewhat resinous lustre, and is
...t fuses at about 4 with intumescence to a

brown glass, gives no water in the closed tube, and with the fluxes gives the reactions for manganese. Fused on charcoal with soda, it gives a hepar. It is soluble in hydrochloric acid, evolving sulphuretted hydrogen and leaving a residue of gelatinous silica.

Its composition, as kindly ascertained by Mr. Reuben Haines, is as follows :

SiO_2	23.10
BeO	11.47
MnO	45.38
Fe_2O_3	2.05
Al_2O_3	2.68
CaO	.64
K_2O	.39
Na_2O	.92
S	4.50
Gangue	9.22
	100.35

In the analysis the glucina and manganese were first separated from alumina and iron by long boiling with ammonium chloride, and were then separated from each other by repeated precipitation by ammonia, the manganese being thrown down by sodium phosphate and weighed as pyrophosphate.

The mineral was separated from the associated impurities by placing upon a filter the total silica, which had been separated by evaporation with acid in the usual manner, and washing it seven or eight times with a hot concentrated solution of sodium carbonate. By this means all the soluble silica of the mineral was separated from any particles of quartz, orthoclase, or other insoluble silicates.

Regarding a part of the manganese as combined with sulphur, and deducting a proportionate amount of oxygen from the analysis, it will stand :

SiO_2	23.10	or, without gangue,	SiO_2	25.48
BeO	11.47		BeO	12.63
MnO	35.40		MnO	39.07
Al_2O_3	2.68		Al_2O_3	2.95
Fe_2O_3	2.05		Fe_2O_3	2.26
CaO	.64		CaO	.71
K_2O	.39		K_2O	.43
Na_2O	.92		Na_2O	1.01
Mn	7.73		Mn	8.66
S	4.50		S	4.96
Gangue	9.22			
	98.10			98.16

[illegible] considerably from the analyses of Helvite [illegible] and does not lead to the formula usually [illegible] desirable that further investigation should [illegible] terial is discovered.
[illegible] ously been found in America.

APRIL 4.

[illegible] dent, Dr. LEIDY, in the chair.

[illegible] present.

[illegible] F. LEIDY stated, that in a recent trip to [illegible] for the first time met with the singular [illegible] red in large number in the same pond in [illegible] noticed *Balanoglossus*. Whether it was [illegible] s former visit he was unable to say, as [illegible] arent as the water in which it lives, and [illegible] ervation. His attention was accidentally [illegible]. Along the edge of the pond there were [illegible] bodies, flaccid and motionless, which he at [illegible] of a bleached alga. From the uniformity [illegible] d to examine them more closely, when he [illegible] ater, more transparent, lying on the sand [illegible] g suddenly and so actively as to send a [illegible] surface. On transferring some of these [illegible] ted their nature. Subsequently the water [illegible] th the little creatures. They are exceed[illegible] ckly die after removal. In life they are [illegible] d colorless, and move actively at intervals [illegible] ic jerk, bending the tail downwards and [illegible] r death they become flaccid, dull and white, [illegible] ce of the multitude of dead ones on shore. [illegible] sting as being one of those peculiar ani[illegible] d naturalists as to its exact relative posi[illegible] regarded as the representative of an order [illegible] e of Chætognatha.
[illegible] *gans*, has been described by Prof Verrill, [illegible] s Holl, Vineyard Sound, and Gay Head, [illegible] Coast, and he refers to a second undeter[illegible] g in Vineyard Sound.
[illegible] ic City appears to differ from the former, [illegible] r described species found elsewhere, and [illegible] ished from them by its greater number of [illegible] may be characterized as follows:

[illegible] nimal transparent, colorless; body compressed, [illegible] wo pairs of lateral hemielliptical fins, separated [illegible] er and the broad obcordate caudal fin, which is [illegible] ad obcordate, about as broad as it is long. Pre-

oral series of spines, 6 or 7 in each, minute; postoral series 18 in each, successively decreasing. Mandibular hooks, from 11 to 14 in each series, usually 12, besides an immature one, scythe-shaped, yellowish brown in color. Length, about three-fourths of an inch; width, 1½ to 2 mm. Head 1 mm.; caudal fin 1.5 to 1.75 mm. wide. Mandibular hooks 0.75 mm. long.

At the same time, as previously, numerous mounds of the *Balanoglossus aurantiacus* were observed. There were also noticed in the same pond, many projecting tubes of sand, which were found to contain *Clymena torquata*. Further, several specimens of *Glycera americana* were collected. On the shore of the pond in one place *Donax fossor* appeared to have its residence; and among *Solen ensis*, a single living *Solecurtus gibbus* was found.

APRIL 11.

Mr. S. FISHER CORLIES in the chair.

Twenty-three persons present.

A paper entitled "Description of new species of Terrestrial Mollusca of Cuba," by Rafael Arango, was presented for publication.

APRIL 18.

Dr. W. S. W. RUSCHENBERGER in the chair.

Thirty-four persons present.

Orthite from Amelia C. H., Va.—Prof. GEORGE A. KÖNIG communicated the discovery of orthite among the minerals occurring at the mica mine of Amelia Court House, Va. The speaker has seen only two fragmentary crystals, a large one, nearly four inches long by one inch wide and one-fourth of an inch thick. Both ends were broken. It presents the combination of a flat prism with the brachypinakoid. In the position of epidote the prism will be equal to a series of brachydomes. There is a pronounced cleavage parallel to the macro- and brachypinakoids and to the basal plane. The crystal is enveloped by a thin reddish brown crust of soft altered material, while the interior is pitch black and hard. Fracture uneven. A plate was cut parallel to the basal plane which only became green translucent at a thickness of $\frac{3}{100}$ of an inch. It was found that a number of opaque small spots were scattered through the leek-green mass on a few spots showing strong polarization, which are probably hydromuscovite.

This section behaves like a uniaxial substance; it is dark with crossed prisms, and light when their position is parallel. The plane of the optical axes is therefore parallel to the basal plane.

[illegible] C^0 = 3,368. A thin splinter boils up in [illegible] ow-pipe, and fuses to a dark blebby slag. [illegible] manganese bead. Decomposed by con- [illegible] and also by moderately dilute sulphuric [illegible]s

SiO_2	=	32.90
Al_2O_3	=	17.80
Fe_2O_3	=	1.20
CeO_2	=	8.00
La_2O_3, Dy_2O_3	=	14.20
FeO	=	10.04
CaO	=	11.32
MnO	=	1.00
H_2O	=	3.20
		99.66

[illegible]m are not present; but a trace of uranium [illegible]

APRIL 25.

[illegible]dent, Dr. LEIDY, in the chair.

[illegible]t.

[illegible]ickeson, M. D., a member, was announced.

[illegible]. Darwin, a correspondent of the Academy, [illegible], the following were unanimously adopted:

[illegible]demy of Natural Sciences of Philadelphia, [illegible] of Charles R. Darwin, F. R. S., of Down, [illegible]

[illegible]Academy of Natural Sciences of Philadel- [illegible] its sense of the great services which have [illegible]ce and scientific thought by Mr. Darwin, [illegible]which it in common with the entire scien- [illegible]d in his death.

[illegible]Academy desires to express its sympathy [illegible]Darwin in their bereavement.

[illegible]y of these resolutions be sent to the family [illegible]

[illegible] was elected a Curator to fill the vacancy [illegible] Dr. Robt. S. Kenderdine.

[illegible] elected a member.

[illegible]dered to be printed :—

DESCRIPTIONS OF NEW SPECIES OF TERRESTRIAL MOLLUSCA OF CUBA.

BY RAFAEL ARANGO.

Chondropoma deceptor Arango.

Testa umbilicata, oblongo-turrita, tenuiscula, costis longitudinalibus lirisque elevatis confertis decussata, pallide aurantiaca, fasciis interruptis rubris fere, sæpius obsoletis ornata; spira regulariter attenuata, sublate truncata; anfractus superstites 5 convexi, ultimus circa umbilicum angustum distincte spiraliter striatus; apertura verticalis, angulato-ovalis; peritrema duplex, internum nitidum, externum late patens, concentrice striatum ad anfractum contiguum angustatum, umbilicum lamina lata fornicata fere tegens. Operculum flavescens.

Longitudo testæ truncatæ 22–25 mill., diam. 10 mill., cum peritremata 15 mill.; apertura 7 mill. longa et 5 mill. lata.

Simile quoad umbilicum et testæ formam *Chondr. canaliculato*, sed bene distinctum ab hoc et *echinulato* atque *sinuoso* sculptura non asperata.

Habitat.—" Mogote de la Iagua " prope La Palma in Provincia Pinar del Rio in agris D. Rafael Azcui.

Chondropoma Hamlini Arango.

Testa umbilicata, oblongo-turrita, tenuis, nitens, liris spiralibus et costulis longitudinalibus æque distantibus echinatim decussata, rubella, fasciis interruptis rubro-fusciis (in ultimo anfr. 7) ornata; spira regulariter attenuata, late truncata; anfr. superstites 4, ultimus circa umbilicum angustum spiraliter substriatum; apertura verticalis, angulato-ovalis; peritrema simplex, nitidum, læve, expansum, sed ante anfractum contiguum angustatum eumque non attingens. Operculum rubellum.

Longitudo testæ truncatæ 15 mill., diam. 11 mill., cum peritremate 19 mill.; apertura 4 mill. longa, 3 mill. lata.

Habitat.—" Cerro de Cabras, vega de los Franceces dicta " prope oppitum Pinar del Rio.

Cylindrella triplicata Arango.

Testa subrimata, cylindraceo-turrita, solidula, remote filoso-striata, straminea; spira elongata, medio paulo ventrosior, apice plerumque truncata; anfr. 15–16 planiusculi, ultimus breviter

...pertura subcircularis; peritrema album,
...m; sutura profunda, non crenulata.
...æ 14 mill., diam. 3 mill.
...s, lamellis 3 validis æqualibus parallelis

...*ndrellis* cubanis forma columnæ internæ.
...*liratæ* Jim. et *mixta* Wr.
...' prope La Palma in Provincia Pinar del
...zcui.

...go.

...rica, tenuiscula sæpe breviter truncata,
..., atropurpurea, nitens; sutura impressa,
...æ integræ 13 vix convexiusculi, subæ-
...solutus, non carinatus; apertura subcircu-
...rema continuum album, tenue, breviter

...æ 19 mill.; diam. 4 mill.
...licissima.
...*uinosa* Mor. differt magnitudine minori,
...ribus, peritremate magis expanso et præ-
...mplici.
...' prope La Palma in Provincia Pinar del
...zcui.

...ormi-cylindracea, tenuis, oblique obsolete
...ascia filari rufo-brunnea, in parte inferiori
...bus anfractubus conspicua ornata; spira
...runcata, sutura subcrenulata; anfr. 13–14
...us costulatus, solutus; apertura subovalis,
...ata; peritrema album, expansum, non

...æ 24 mill., diam. 4 mill.
...ra " in Provincia Pinar del Rio.

...

...siformi-turrita, tenuis, diaphana, chordato-
...breviter truncata, sutura profunda non
...tes 12, planiusculi, ultimus basi obsolete
...itrema ? (unicum specimen fractum est).

Longitudo testæ sine anfractu ultimo imperfectæ 10 mill., diam. 3 mill.

Columna interna 3-plicata, plica superiori ampliori.

Habitat.—" La Chorrera " in Provincia Pinar del Rio.

Cylindrella prima Arango.

Testa rimata, cylindraceo-turrita, solidula, subconfertim obsolete costata, albida; spira supra medium sensim attenuata (in specimine unico) truncata; sutura crenulata; anfractus superstites 13, planiusculi, ultimus basi carinatus, antice breviter solutus; apertura obliqua, subcircularis; peritrema breviter expansum antice ob carinam subsinuatum.

Longitudo testæ truncatæ 17½ mill., diam. 4 mill.

Columna interna plicis 2 descendentibus ornata.

Habitat.—Cuba.

Cylindrella confusa Arango.

Testa rimata, cylindraceo-turrita, solida, confertim striata, albida; spira supra medium sensim attenuata, breviter truncata; sutura non crenulata; anfractus superstites 13, planiusculi, ultimus basi carinatus, antice breviter solutus; apertura subcircularis; peritrema breviter expansum.

Longitudo testæ truncatæ 16 mill., diam. 4 mill.

Columna interna lamellis 2 validis, superiori fortiori, lente descendentibus munita.

Habitat.—Cuba.

Cylindrella difficultosa Arango.

Testa rimata, cylindraceo-turrita, solidula, nitens, obsolete costulata, pallido-straminea; spira breviter truncata, sutura non crenulata; anfr. superstites 10, planiusculi, ultimus basi subcarinatus, non protractus; apertura ovalis; peritrema breviter et in margine sinistro minus expansum.

Longitudo testæ truncatæ 11 mill., diam. 2¾ mill.

Columna interna plicis 2 fortioribus ornata.

Differt a *Cyl. concreta* costulis, ultimo anfr. non soluto, columnæ internæ forma.

Habitat.—Cuba.

Cylindrella consanguinea Arango.

Differt a precedenti testa opaca, ultimo anfractu basi carinato et columna interna laminis 2 debilibus descendentibus munita.

[illegible] et longitudo testæ æqualis sunt illis [illegible]

[illegible]

[illegible] ndrica, solidula, oblique remote lirata, [illegible] truncata; sutura subcrenulata; anfr. [illegible] li, ultimus obsolete carinatus, breviter [illegible], reflexum, præcipue in margine dextro. [illegible] tæ 12½ mill., diam. 3 mill.
[illegible] e lamina una debili munito.

[illegible]

[illegible] ndrica, solidula, subconfertim striata, [illegible] uncata; sutura impressa, non crenulata; [illegible] iusculi, ultimus obsolete carinatus, bre- [illegible] subcircularis; peritrema reflexiusculum.
[illegible] atæ 10 mill., diam. 2½ mill.
[illegible] ex.

[illegible]

[illegible] iformi-cylindracea, solidula, nitens, sub- [illegible] ta, albida; spira regulariter attenuata, [illegible] a, non crenulata; anfr. 17 planiusculi, [illegible] reviter solutus; apertura subcircularis; [illegible]
[illegible] ill., diam. 2¼ mill.
[illegible] lis 2 tenuibus circumvoluta.

[illegible]

[illegible] indraceo-turrita, solidula, sublævigata, [illegible] e truncata; sutura subcrenulata; anfr. [illegible] sculi, ultimus basi non carinatus, antice [illegible] us, apertura subcircularis; peritrema [illegible] e dextro ob plicam interiorem plerumque [illegible]
[illegible] ata, plica superiori ampliori.
[illegible] *ina* testa forma et sculptura, sed columna [illegible]
[illegible] odem loco cum *Cyl. capillacea.*

MAY 2.

The President, Dr. Leidy, in the chair.

Thirty-three persons present.

The death of Edw. Desor, a correspondent, was announced.

On Some Entozoa of Birds.—Prof. LEIDY directed attention to some specimens presented by Joseph Willcox, recently collected by him in Florida. One of the specimens is the head of a Snake-bird, *Plotus anhinga*, with a worm in sight, lying upon the brain; while several other detached worms of the same kind lay at the bottom of the vial. The worm in its singular habitation was discovered by Prof. Wyman, in Florida, in 1861 and 1867, an account of which is given in the Proceedings of the Boston Society of Natural History, volume 12, 1868. Prof. Wyman had kindly presented Prof. Leidy with a specimen of the head of the Snake-bird, with the worms lying on the brain. This he had valued as a memento of his friend, but it had, unfortunately, been lost in the fire at Swarthmore College, last autumn. Prof. Wyman states that the parasites were found coiled on the back of the cerebellum between the arachnoid and pia mater. The number varied from two to six or eight, or even more. In nineteen birds they were detected in seventeen. Mr. Wilcox found the parasite in four out of six birds examined. In the present specimen of a head, a single worm is enclosed between the two laminæ of the dura mater over the position of the interval of the cerebrum and cerebellum. As the parasite appears not to have been named, it was suggested that the name of its discoverer should be associated with it under the name FILARIA WYMANI.

The accompanying four vials contain numbers of worms obtained from the stomachs of the Snake-bird, the Cormorant, *Graculus dilophus*, the White Pelican, *Pelecanus trachyrhynchus* and the Brown Pelican, *P. fuscus*. All prove to be of the same species, the *Ascaris spiculigera*. Specimens of these were also formerly obtained by Samuel Ashmead, in Florida, from the White Pelican, (Proc. Ac. Nat. Sci. 1858, 112). The same, likewise, have been submitted for examination by Dr. Elliott Coues, who procured them from the White Pelican, on the Red River of the North. See Birds of the North West, 1874, 587.

On a Coprolite and a Pebble resembling an Indian Hammer.—Prof. LEIDY further exhibited a specimen which he had picked up from a pile of the irregular phosphatic nodules brought from Ashley River, South Carolina, for the manufacture of a fertilizer. The nodule, of several pounds weight, is a flattened oval black

[illegible] ...sed to be the coprolite of a zeuglodont or [illegible]

[illegible] quartzite pebble, from a gravel bank in the [illegible] ...st Philadelphia. It has a near resemblance [illegible] with a groove around the middle, found in [illegible] ...ines of Lake Superior. Notwithstanding [illegible] evidently a water-rolled pebble, the groove [illegible] ...n a softer stratum of the quartzite.

[illegible] *the Arbor Vitæ.*—Mr. THOMAS MEEHAN [illegible] ...ons given by various authors for the name [illegible] ...ction with *Thuja occidentalis*—reasons [illegible] the authors who advanced them. He [illegible] ...nt of Ray in his "Historia Plantarum" that [illegible] ...duced from Canada to France and named [illegible] Francis the First. Francis died in 1547. [illegible] ...hese plants were raised could scarcely have [illegible] other way than through Jacques Cartier's [illegible], and we may, therefore, conclude that *Thuja* [illegible] ...g the first, perhaps the first North Ameri- [illegible] ...own in Europe. Parkman, in his "Pioneers [illegible] ...y describes the sufferings of Cartier's band [illegible] ...ir encampment near the junction of the River [illegible] ...rles. Twenty-five died of scurvy and the rest [illegible] friendly Indian told him of an evergreen [illegible] ...nedda," a decoction of which was sovereign [illegible] six days the sufferers had drunk a tree as [illegible] *Quercus ilex?*, "the distemper relaxed its [illegible] ...pe began to revisit the hopeless company," [illegible] ...da seems to have been identified with the [illegible] ...*ba*, and is, as I am informed by Dr. W. R. [illegible] ...he Mohawk "Onnita," and the Onondaga [illegible] ...g to Rafinesque, the spruce beer of the [illegible] ...he young tops and young leaves of this tree [illegible] ...aple sugar, and was one of their famous [illegible] ...Rafinesque also says that a decoction of the [illegible] ...tæ was an Indian remedy for scurvy and [illegible] the leaves with bear's grease being used [illegible], however, believes it was the White Spruce [illegible] ...f Cartier's band, and if the "Annedda" of [illegible] ...e White Spruce, the evidence through the [illegible] ...n after Cartier's expedition that the health- [illegible] "Annedda," is strong. But spruce beer [illegible] ...ade in the winter season—the leaves only [illegible] no evidence that the White Spruce was [illegible] ...wards the end of the 18th century. It is but [illegible] ...he tree might have been, it was a veritable [illegible] *de Vie*, to the voyagers. They would [illegible] ...ffort to take with them to their native land

so valuable a tree. But we have no reason to believe that they attempted to introduce the White Spruce. There is, as we have seen, good reason to believe that Cartier took the *Thuja occidentalis* to Europe, and it is on record that his royal patron, a few years afterward, distributed the tree as the *Arbor Vitæ*, and, notwithstanding the seemingly positive evidence that the tree was the White Spruce, Mr. Meehan thought the *Thuja* had some ground for disputing the claim. At any rate, whatever may have been the real tree, he could not help suspecting that the name *Arbor Vitæ* had some relation to this touching episode in the history of the Cartier expedition.

MAY 9.

The President, Dr. Leidy, in the chair.

Twenty-seven persons present.

A paper, entitled "The Muscles of the Limbs of the Raccoon (*Procyon lotor*)" by Harrison Allen, M. D., was presented for publication.

The death of Chas. M. Wheatley, a member, was announced.

The death of Mr. Wm. S. Vaux having been announced, Dr. Ruschenberger read the following resumé of his services as an officer and member, and offered the appended resolutions, which were adopted:—

I sincerely regret to announce that Mr. William S. Vaux, the senior Vice-President of the Academy, died at his residence in the city, May 5, 1882, very near the close of the seventy-first year of his age. He was born May 19, 1811.

Mr. Vaux was elected a member of the Academy, March, 1834, and during more than forty-eight years served the Society effectually and generously. He was an Auditor thirty years, from December, 1856; a Curator forty-three years and four months, from December, 1838; a member of the Publication Committee, of which he was treasurer more than forty-one years, from December, 1840, and a Vice-President twenty years and four months, from December, 1860, excepting the year 1875.

His annual re-election to these important offices during all this time, implies that he discharged all his official duties satisfactorily to the Society.

During the construction of the hall, at the corner of Broad and

... the Society held its first meeting, Feb... an active member of the Building Com... the same capacity when the building was ... December, 1851, when it was determined ... previously enlarged hall, a work which ..., 1855, he was elected a member of the ... discharged all his duties efficiently.

... was appointed a member of the Com... cit subscriptions for the erection of the ... Society, and in January, 1867, he was ... Board of Trustees of the Building Fund, ... the Fund, and a member of the Building ... ch he held when he died.

... enterprises he was earnestly interested, ... them himself, and by his invitation and ... s to give. To the present building fund ... ousand dollars, the largest sum given by ...

... the Building and other Funds, he con... museum, especially to the departments of ... y, in which he was particularly interested, ...

... his long and useful services and bounty ... nt to indicate that the Academy has sus... the death of Mr. Vaux. As a token of the ... his worth, I submit the following resolu...

... members of the Academy of Natural ... ia, deeply regret the death of the senior ... S. Vaux, who was an experienced officer, ... a steadfast and beneficent friend of the ...

... dents of the natural sciences have lost a ... contributed liberally to the means and ... ssession of the institution.

... condolence, a copy of these resolutions, ... lent and Recording Secretary, be trans...

MAY 16.

MR. MEEHAN, Vice-President, in the chair.

Twenty-eight persons present.

Influence of Heat on the separate Sexes of Flowers.—Referring to his former observations, in which it was noted that less heat was required to advance flowers than leaves, and still less for male than for female flowers, Mr. MEEHAN called attention to a communication in an English scientific periodical, showing that the same facts may exist in the English climate as in our own. It appears that this season, according to the correspondent of Hardwicke's *Science Gossip*, the male flowers of the hazel-nut, *Corylus Avellana*, had been brought forward and perfected, before any signs of the female flowers appeared.

Liquid Exudations in Akebia and Mahonia.—Mr. WM. M. CANBY called attention to the exudation of moisture from the tips of the leaflets in *Akebia quinata*, a plant twining over a trellis near his porch dripped moisture enough to make the floor look as if sprinkled. An examination of the leaflets by Prof. Rothrock disclosed an arrangement of the tissue at the apex of each leaflet, evidently adapted to such an exudation. Mr. MEEHAN had been led by Mr. Canby's observations to watch closely a plant growing over a trellis on his house, confirming Mr. Canby's experience. The liquid globules on each leaflet were of the size of ordinary pin-heads. Their appearance was not constant, nor did there appear any regular period for the emission of the fluid. It was as likely to appear when the atmosphere was dry as when moist, or at midday as at evenings. The close relationship of *Lardizabalaceæ* to which *Akebia* belonged, to *Berberidaceæ*, led him to examine *Mahonia aquifolia*, flowering at the same time, and he found in many flowers just before expansion a small globule at the apex of the pistil, and in the same bud globules pressing through the divisions of the corolla. These would collect as they flowed out, and globules as large as peas, and of a quicksilvery hue, were not unfrequently found among the mass of flowers forming the densely fasciculated head. The fluid was of a viscid character. Only a few flowers exhibited the exudation at each examination, and he was led to believe that the flow in each flower was soon over. In *Thuja* there was also this sudden appearance of a small globule at the open mouth of the naked ovule, and which seemed to disappear very soon after its formation. In a large number of flowers examined only a few with globules at the apex were found at each examination. The liquid in this case did not disappear by evaporation, but seemed to be absorbed by

...ggests a use for the exudation in coniferæ. ...o the globule by the winds, and, as the ...he vesicle, the pollen grain is carried to ...ization is effected by actual contact. It ...cult for the pollen to affect the nucleus in ... coniferæ, as in ordinary flowers, in the ...xudation.

...in Species.—Mr. MEEHAN remarked on the ...ok on striking variations in species as the ... To his mind there were few species that ...ange of individual variation in some par... ...od opportunities to look for them. He ...ones taken from different trees of *Pinus* ...tlantic County, New Jersey, and pointed ...d. Some double in length of their width, ...ttish base, others perfectly globular being ... Some had very narrow scales, and some ...and again, some reflexed to a wonderful ... some with the broad scales would only ...ree. Some trees would have cones several ...dth, while others had cones barely an inch ...ct seeds. The cones were in a regularly ...cal *P. rigida* at one end, at the other the ... distinguished from *P. serotina*. The ...n away from the central one left it to ...etween the two.

...e was evidently a law of nature providing ... Whether this law of individual varia... ...at law of variation which resulted in the ...cies, might well be a question. It was at ...the two classes of variation for practical

...Dr. McCook and Mr. Redfield discussed ... Meehan's communication.

...ered to be printed :—

THE MUSCLES OF THE LIMBS OF THE RACCOON (PROCYON LOTOR).

BY HARRISON ALLEN, M. D.

The genus *Procyon* is known to be one of the most ancient as well as one of the most generalized of the carnivora. The study of such a form when made in comparison with the more recent and more specialized genera, presents many features of interest. The following account of the muscles of the limbs has been undertaken with a view of ascertaining more especially what differences exist between these muscles and those of *Felis domesticus*,[1] and of man. Occasionally references to *Nasua fusca* were also made. Many variations in the human subject were found to correspond to the normal arrangement in *Procyon*. Since the subjects of nerve and muscle are intimately associated, not only anatomically but physiologically, it is stated from which nerve trunk each muscle derived its supply.

The material for dissection consisted of two adult females, obtained through the courtesy of Prof. Alexander Agassiz, of the Museum of Comparative Zoology, Cambridge, and of Mr. Arthur E. Brown, Superintendent of the Zoological Garden, Philadelphia.

The Muscles of the Superior Extremity.

(a) *Extrinsic Set.*

The Cephalo-humeral Muscle is a broad, flat, fleshy muscle arising from the occiput at its crest for a distance of eight lines, and from the ligamentum nuchæ for one inch and a quarter, that is to say, for a distance equal to one-half the length of the dorsum of the neck. The muscle passes obliquely downward over the front of the shoulder, and is narrowed gradually to be inserted by fleshy fibres into the linear ridge on the anterior surface of the humerus. It blends with the tendon of the Pectoralis Secundus —and indeed may be said to be inserted by fleshy fibres *upon* the lower part of the fibrous portion of this muscle. A tendinous inscription passes through the muscle opposite the head of the humerus. Connected with the under surface of this inscription

[1] When the domestic cat is referred to in the text the word "Felis" is used.

...asses over the head of the humerus and
... and the metacromion. This fascia em-
... the Levator Anguli Scapulæ and appears
...ect of the Cephalo-humeral muscle.
...cle is in close relation with this muscle.
... bone is occupied by a stout membrane
...and forward to the axilla, where it is lost
...the Subscapularis muscle. This mem-
... the Supraspinatus muscle, and separates
...om those of the region of the Scapula.
...upper division arises from the occiput at
...superior curved line, and from the liga-
...ver half. It is inserted upon the border
...ula for its anterior three-fourths, and is
...eurosis with the lower division over the
...lower division arises from the last cervical
...rsal spinous processes, and is inserted
... two fourths of the scapular spine, at the
...rectly (by reason of a union with the
...sis) upon the remaining half of the spine.
...s of the third and the fourth dorsal nerves.
...*ulæ* arises from the occiput beneath the
...passes downward along the side of the
...pon the under surface of the tendinous
...alo-humeral muscle for its entire length,
...icle for its entire length. Its nerve-supply
...st trunk of the brachial plexus.
...*Scapulæ* arises from the anterior half of
...of the body of the axis. It passes down
...o be inserted on the acromion, where its
...th those of the Trapezius. It is supplied
...st trunk of the brachial plexus.
...called Trapezius and Levator Claviculæ,
... of a single muscle, each of which bears
... somewhat analogous to that which the
...ectoralis muscle bear to one another. As
...l influence the movement of the humerus,
... fibres are not inserted directly into the
... through the advent of membranous,

But in addition to this the Levator Scapulæ and at least one part of the Trapezius, are inserted into the spine of the scapula, while the Levator Anguli Scapulæ, so called, is inserted into the acromion, so that the group is even less specialized than is the Pectoralis group, inasmuch as it is inserted into two bones of the anterior extremity, the scapula and the humerus. The Levator Anguli Scapulæ becomes superficial between the Cephalo-humeral and the scapular fibres of the Trapezius, while the Levator Claviculæ lies deep-seated beneath the Cephalo-humeral, and while being inserted at the tendinous inscription of the latter is in close relation to a thin fascial expansion that lies directly over the shoulder-joint. The Levator Anguli Scapulæ and the Cephalo-humeral muscles in their turn terminate in part upon an aponeurosis which passes over the Deltoid muscle and is lost on the Infraspinatus, the Teres Major and the Triceps muscles, and with which the epitrochlear slip of the Latissimus Dorsi is in intimate association.

This single great muscle, therefore, can draw the scapula and the humerus forward; through its traction on the clavicle make tense the subscapular fascia; through the fibres of the Levator Anguli Scapulæ make tense the sheath of the muscles of the extensor surface of the arm, and through the agency of the dorso-epitrochlear slip of the Latissimus Dorsi, the fascia of the rest of the upper extremity.

The Rhomboideus arises tendinously from the occiput seven lines from the median line. It arises, also, from the ligamentum nuchæ its entire length, and from the five upper dorsal spines. It is inserted with the Serratus Magnus at the upper border of the scapula for nine lines. The posterior third of the fibres at the vertebral border are coarser than the remainder. Some of the fibres pass upward upon the dorsum of the scapula. It is supplied by branches of the cervical plexus at the middle of the lateral border.

The Serratus Magnus arises from the transverse processes of the fourth, the fifth, the sixth and the seventh cervical vertebræ and from the first seven ribs. It is inserted into the vertebral border of the scapula its entire length.[1] Its nerve-supply is from the long thoracic.

[1] The vertebral border is separable from the anterior by being twice its thickness, and in being limited anteriorly by the triangular base of the spine.

... *si* arises from all the dorsal spines, from ... sis, and from the twelfth, the thirteenth and ... It is inserted into a linear rugosity on the ... placed to the median side of the deltoid ... tendon of the endo-pectoral portion of the ... e dorso-epitrochlear slip equals in width the ... tion. It arises by a broad origin from the ... to the formation of its tendon, and is ... upon the median margin of the olecranon ... The internal dorso-epitrochlear slip seen in ... A long, slender slip of the ventral border of ... rted upon the central axillary tendon. It ... is branches from the intercostal nerves, and ... ch of the brachial plexus.

... r muscle is divided into two portions. That ... rficial at the ventro-anterior aspect of the ... of Wilder) arises from the sternum, a little ... length, also from an intermuscular septum ... scle of the opposite side, extending thence ... ernum along the median line of the neck. ... deltoid ridge of the humerus, and into the ... between this ridge and the head of the ... d this muscle is inserted with the Cephalo- ... n is fleshy throughout, except at the under ... It represents the *P. primus*, *P. secundus* ... r mammals. An imperfect attempt is made ... e *P. quintus*, but none of the *P. primus*.

... is deep-seated at the ventro-anterior aspect ... pectoral of Wilder) embraces a broad and ... ted sheet of fibres pertaining to the Pannic- ... mass. The two divisions fuse intimately, ... t be separately described. They together ... *us* of other mammals.

... description of a muscle may here with ..., and the insertion described before the ... h the fibres of insertion of the superficial ... is a thin fibrous sheet that is attached to ... the median side of the insertion of the ... t extends from this line upwards over the ... Biceps, and is lost in the capsule of the

shoulder-joint and in the fascia over the coracoid process, as well as that beneath the Subscapular muscle. It passes downward beyond the ridge, where it receives a few fibres from the superficial portion and is lost in the antebrachial fascia.

It is nearly as broad as long, and in every part is distinct from the superficial portion of the Pectoral. In this description of the Pectoral group the membrane will receive the name of the *fibrous membrane of insertion or the central axillary tendon.*

The pannicular division of the deep mass arises as a broad sheet from the superficial fascia of the trunk, its dorsal portion from the sacrum to over the scapula, and the ventral portion from over the middle line of the thorax. Its fascicles converge toward the axilla, some of them fusing with the lower margin of the sternal sheet, and others ending on the posterior margin of the fibrous membrane of insertion. Others yet are inserted about the middle of the under (ventral) border of this membrane of insertion.—The sternal sheet arises from the sternum at the lower border of the superficial portion, which overlaps it, to the base of the ensiform cartilage, as well as from the subcutaneous tissue at the præcordium. It is a ribbon-shaped, fleshy muscle, and ends on the membrane of insertion by distinct fibres, and is continued over it to the deltoid ridge. These fibres are free from the membrane at the upper half of the line of insertion. Placed between the pannicular and the sternal sheets, a third fascicle is received, viz., a marginal slip from the Latissimus Dorsi.

Arising from the lower margin of the membrane of insertion, is the median dorso-epitrochlear slip. It fuses with the Trapezius at its distal half. It is inserted on the median margin of the olecranon, and contributes to the formation of the antebrachial fascia.

Muscular fibres thus approach the aponeurosis of insertion of the deep portion of the pectoral from the skin of the back and abdomen, from the sternum and from the Latissimus Dorsi. The lower margin of the membrane receives more fibres than the remaining portions, while the proximal parts receive none. The sternal sheet at its upper half tends to be specialized from the membrane, and throughout can be said to adduct the humerus. The pannicular sheet, together with the Latissimus slip, may be described as a tensor of the sheath of the Biceps and of the capsule of the shoulder-joint. The median dorso-epitrochlear slip protects the nerves of the upper arm.

...r (P. Tertius) arises from the second to the ... inclusive, to the outer side of the sternum, ...usly into the bicipital border of the great ...rus. It here forms the anterior part of the ... with the Supraspinatus muscle. This ...bed in human anatomy as being inserted on ...s being continuous with it.

...on of either the Pectoralis Major or Pecto-...erted into the antebrachial fascia. The ... by branches of the brachial plexus and of ...

(*b*) *Intrinsic Set.*

... *and the Infraspinatus Muscles* do not ...ts of difference as compared with the same ...mals to deserve special description. The ... great part, bilaminated, the interlaminate ... forward. The origin of the Deltoid and ...rapezius largely conceal the Infraspinatus. ...d from the suprascapular nerve.

... is composed of three main sub-divisions. ...these arises from the anterior border of the ...ngth, and the intermuscular septum between ...us muscle. It is inserted into the humerus. ...gin to the Coraco-Brachialis. Its fibres are ...the last-named muscle, and may be said to ...continuity with them. The tendons of the ...s of the Subscapularis underlie the tendon ...

...ly free from insertion into the delicate cap-...int. It is supplied by three nerves, each of ...he brachial plexus.

...es from the aponeurosis of the Infraspinatus, ...n of the Subscapularis near the scapular ...a small portion of the scapula at the upper ...order. The muscle is tendinous where it ... and is inserted beneath the Pectoralis ...an side of the bicipital groove.

... origin of the Teres Major lies the insertion ... The muscle is supplied by a branch of the ...

Teres Minor.—This muscle is so intimately fused with the Infraspinatus as not to demand a separate description.

Deltoid.—The fascicle from the fascia over the Infraspinatus muscle joins the fascicle from the acromion at the distal half of the latter. The two fascicles thence continue as a single muscle to the humerus. The nerve-supply, which is from the anterior circumflex, is abundant. The most important fascicle would appear to be from the Infraspinatus fascia. The tendon receives the terminal fascicle on its outer surface, and its tendon of insertion lies in contact with the tendon of origin of the outer head of the Triceps.

The Triceps possesses four heads. The first arises from the scapula, as in man, by a thin tendon as broad as the muscular belly, and is inserted into the tip of the olecranon.

The second, or lateral humeral portion, from the lateral aspect of the neck of the humerus by a flat, thick tendon, one-fourth the greatest width of the belly. It is inserted into the tendon of the preceding, and into the olecranon on the lateral border, and into the ulna at its upper fourth, where it becomes continuous with the Profound Flexor as it arises from the posterior edge of the ulna. The second portion receives an accession of muscular fibres from the posterior median portion of the neck of the humerus. It joins the belly half way down the humerus.—The third portion arises by a flat, thin tendon from a median surface upon the humerus at its upper third. It merges in part with the small Coraco-Brachialis. It also arises from a distinct broad surface upon the border of the humerus between the epitrochlea and the upper border of the epitrochlear foramen. This slip is inserted into the olecranon and is merged with the origin of the Flexor Carpi Ulnaris. This is quite a frequent human anomaly.

The scapular head of the Triceps, with the internal humeral fasciculi, form parts of a single bilateral laminated sheet. The dorsal portion of this sheet is aponeurotic at and near the olecranon, and is continuous with the antebrachial fascia. The external humeral head from the proximal end is bilaminate one-half its entire length.[1]

[1] In *Felis* the internal humeral head is distinct from the scapular, and the bilaminate arrangement is in all parts of the muscle less evident than in *Procyon*.

[illegible] second head arises from the epitrochlea [illegible] down parallel to the foregoing, and is [illegible] bone to the median side of the first [illegible] ead also arises from the epitrochlea in [illegible] Sublimis Digitorum. The muscle lies [illegible] Profundus, and does not touch the ulna. [illegible] first head is very minute, and confined [illegible] end of the belly. That for the second [illegible] being received from the ulnar nerve at [illegible] g the proximal half of the belly.

[illegible] Procyon the two divisions of the Flexor [illegible] cribed are equivalent to distinct muscles. [illegible] seen in *Felis*, no attempt at fusion [illegible] umeral heads is seen, while the tendency [illegible] use with the superficial flexor is seen in [illegible] much less degree in *Procyon* than in [illegible]

[illegible] he Palmaris Longus was double in one [illegible] arising in common with the Flexor [illegible] n the other specimen it was found to be [illegible] ply little or none.

[illegible] *itorum.*—This muscle arises from the [illegible] vides into two portions. One of these [illegible] to the Flexor Profundus Digitorum; the [illegible] divides into two parts, one of which is [illegible] d the second toes, and the other on the [illegible] The slips for the first and the second [illegible] s, one for each side of the sheath of the [illegible] phalanx. In one specimen, the first toe [illegible]

[illegible] om a small branch of the median nerve.

[illegible] the insertion of the muscle and the fifth [illegible] less decided than between the Extensor Carpi [illegible] Such connection has been omitted as part of [illegible] the muscle.

[illegible] essively along a ridge (supracondyloid ridge). [illegible] a "bunch" at a process (not a ridge), the [illegible] ted. This muscle lies by itself above and in [illegible]

The failure of the superficial flexor to support the sheaths of the third and fourth digits, may occur as an anomaly in man.[1]

The Flexor Profundus Digitorum arises in a penniform manner from the ulna, as follows: 1st, from the concavity on the median surface of the olecranon; 2d, from the posterior border of the ulna at the upper third; and 3d, from the median surface of the ulna at its middle third, near the distal end. The second portion derives some fibres from the membranous expanse of the Triceps on the lateral surface of the olecranon, and the intermuscular septum between it and the Extensor Indicis. Its tendons pass to the four outer toes. The under part of the tendon at the wrist is smooth.

Macalister[2] does not mention the union with the Triceps tendon. This might be found to vary in man. The nerve-supply of this muscle is from the median nerve.

The Flexor Longus Pollicis is composed of two separate portions, a superficial and a deep. The superficial portion arises in common with the Flexor Carpi Radialis from the epitrochlea. It is fleshy for the upper third of its course, and joins the Flexor Profundus Digitorum at the lower border of the annular ligament. Just prior to the formation of the tendon, muscular slips join the bellies of the Flexor Sublimis Digitorum and the Flexor Profundus Digitorum. Below the annular ligament the tendon for the thumb leaves the Profundus and passes to the second phalanx. From this tendon arises a Lumbrical muscle. A large slip passes from the fleshy portion to the tendon of the deep flexor just above the annular ligament.

The deep slip is penniform in character. It arises from the radius at its upper third, and joins the conjoined tendon at the upper border of the annular ligament. The last-named slip is evidently homologous with the anthropodean muscle of the same name. The nerve-supply is from the median.

It is interesting to note that the variations of this muscle in the human subject include in essential features the above arrangement. Mr. Carver[3] describes as arising partly from the Profundus

[1] In *Nasua fuscus* the slips of union between the superficial and the deep flexor are *three* in number, and are inserted on the conjoined tendon above the annular ligament. The union of the Sublimis with the Profundus occurs below the tendon.

[2] Trans. Royal Irish Acad., xv, 1872.

[3] Jour. of Anat. and Phys., iii, 260.

... arises from the lateral aspect of the ulna ...on, and, for a slight distance, from the ...he Flexor Profundus. Its tendon passes ... reaches the manus by running beneath ...nsor Communis Digitorum beneath the ...tendinous slips are inserted upon the first, ...ngers to the lateral side beneath the three ...or Communis. The muscle receives a ... Extensor Minimi Digiti, and is thus an ... Extensor Carpi Ulnaris and the Extensor ...eives two branches from the posterior ... musculo-spiral nerve.

...xtends from the middle of the forearm to ... the distal epiphysis of the radius and of ... toward the wrist than toward the elbow ... and inconspicuous. The radial fibres are ...out aponeurosis so conspicuous in *Felis*. ...m a deep branch of the interosseous.

...es as a single slip from the annular liga-...e base of the fifth toe.

...s of the Manus embrace the following:—

...*is.*—This insignificant fascicle arises from ... the sheath of the Flexor Carpi Radialis, ... proximal end of the first metacarpal bone. ...e with some of the fibres of origin of the ...eal Flexor.

...*ei.*—These muscles are three in number. ..., passing respectively to the first phalanx ...rst phalanx of the annularis, are twice as ...ich goes to the first phalanx of the index ...from the fibrous tissue over the proximal ... bones.

...*giti* arises in common with these muscles ...d is fused at its proximal third with the ...erted into the distal end of the metacarpal

...*i Digiti* arises from the annular ligament ...heath of the Flexor Profundus Digitorum ...imilar to that found in the pes.

Abductor Minimi Digiti arises from the pisiform bone and ends by a long aponeurotic tendon upon the sheath of the first phalanx of the fifth toe in its lateral aspect. The muscle receives an accessory slip from the connective tissue beneath the deep flexor.

The Metacarpo-Phalangeal Flexors.—Each arises from the metacarpal bone of the corresponding toe and is inserted into the sesamoid bone of the metacarpo-phalangeal joint. The fifth toe alone possesses the Dorsal Interosseus, and even in this instance the muscle is in great part fused with the flexor muscle. For the remaining toes the Dorsal Interosseus is undifferentiated, yet latero-dorsal slips of tendon connect those parts of the flexor muscles seen from above in the intercarpal spaces, with the sides of the sheaths of the digits. As in the pes, so in the manus the divisions between the two portions of the flexors are more pronounced in the hallux and annularis than in the remaining toes.[1]

The Muscles of the Inferior Extremity.

(*a*) *Extrinsic Set.*

Quadratus Lumborum.—This muscle has not been differentiated from the vertebral series in *Procyon*. On the ventral aspect a flat slip is seen arising from the second lumbar vertebra on a line with the origin of the transverse abdominal muscle. It passes upward and outward to be inserted on the last rib at about its middle. A second flat slip, lying a little below the preceding, and on a deeper plane, appears to be a cleavage from the internal oblique abdominal muscle. It arises from the ventral aspect of the Longissimus Dorsi, and is inserted into the last rib at its

[1] The Lumbricales, Palmar and Dorsal Interossei muscles of *Procyon* may be described as inserted into the sheath of the digit. In the manus of the Macaque this was seen to be the case also. It will be remembered that in human anatomy the Dorsal Interossei are described as having their insertions into the extensor tendons of the digits as well as into the base of the first phalanx of each finger. It is probable that the simplest expressions of these muscles in mammals are as *tensors of the sheaths* of the digits on the dorsal and lateral surfaces, and that their connection with the tendons of the extensors of the fingers is not an essential one. Indeed the extensor tendons themselves may be said to end upon the same sheath, the latter being described as enveloping each digit like the fingerstall of a glove. It is free everywhere between the interphalangeal joints above and at the sides, but is closely incorporated with the capsules of the last-named joints as well as with the sheaths of the flexor tendons.

[illegible] slips are, perhaps, representative of the [illegible] Quadratus. The ilio-vertebral fibres are [illegible] fectly differentiated slip, extending from [illegible] iliac crest to the transverse processes of [illegible]

[illegible] is very conspicuous from the ventral [illegible] doubtless affords the generalized mass [illegible] tus Lumborum of human anatomy has [illegible]

[illegible] om the ventral surfaces of the bodies of [illegible] vertebræ, and is fused with the Psoas [illegible] by a broad, glistening aponeurosis into a [illegible] ilium, directly above the ilio-pectineal [illegible]

[illegible] from the bodies of the third, fourth and [illegible] d the anterior surface of the corresponding [illegible] fter being joined by the Iliacus Internus, [illegible] ter winding around the neck of the femur, [illegible] or. Both the Psoas muscles are perforated [illegible] bar plexus, the Psoas Magnus being more [illegible] y a number of short filaments from the [illegible]

[illegible] es by a long slip the entire length of the [illegible] oad sheet of fibres extending across the [illegible] below the attachment of the ilio-lumbar [illegible] us Lumborum, and also by a thin slip [illegible] of the Rectus Femoris. The muscle is [illegible] lvis. The anterior margin overlies the [illegible] ginæ Femoris and of the Rectus Femoris. [illegible] oas Magnus at the upper margin of the [illegible]

[illegible] d the Psoas Minor unite with the verte- [illegible] they are imperfectly differentiated, in [illegible] ebral flexor, which can be traced upward [illegible] as the body of the ninth dorsal vertebra. [illegible] e divided into several imperfectly defined [illegible] between which carry the branches of the [illegible] ses.

[illegible] is here included, for while acknowledged to be [illegible] portant relations to the innominate bone.

Gluteus Maximus.—The Gluteus Maximus arises from the ilium, the vertebral aponeurosis, the lateral margin of the sacrum and the transverse process of the first caudal vertebra. The iliac origin is membranous, its under surface being in intimate union with the Gluteus Medius. The sacral origin is musculo-tendinous, as is that from the first caudal vertebra. The common sheet formed by the union of the two surfaces last named, affords origin for a slip of the Lateral Caudal muscle. The margins of the Gluteus are muscular throughout their entire length, but the muscle becomes tendinous as it overlies the trochanter major. It is in close connection if not continuous with the upper margin of the Quadratus Femoris at its insertion. The Gluteus Maximus is inserted into the third trochanter, which lies rather upon the anterior than upon the lateral surface of the femur, and by a well-defined slip into the fascia lata.

The anterior border of the Gluteus Maximus is inseparable from the corresponding border of the Gluteus Minimus.

The nerve-supply of the Gluteus Maximus is derived from branches piercing both the Gluteus Medius and the Gluteus Minimus near their anterior borders: the longest branch (arriving from the great sciatic nerve) lying on the under surface of the muscle, corresponding pretty accurately to that portion arising from the sacrum and the first caudal vertebra. In addition to these nerves the muscle receives several branches of the Inferior Gluteal nerve. The entire muscle easily resolves itself into two portions, which, however, cannot be separated by the knife. The anterior portion, of iliac origin, receives nerves by distinct Gluteal branches, and becoming fused with the Gluteus Medius, rotates the femur inward; while the posterior portion arises entirely from the sacrum and first caudal vertebra, fuses with the Tenuissimus, and, receiving the distinct and very long gluteal branch already mentioned, rotates the femur outward. The last-named muscular portion is extrinsic to the posterior extremity, while the first-named is intrinsic.[1]

[1] That portion of the Gluteus Maximus described as the second part in *Felis*, was not present in *Procyon*. The caudal or ventral origin of the Biceps Femoris would appear to compensate for its absence. The second part of the Gluteus Maximus of the cat is, in all probability, the same as the high origin of the Biceps Flexor, since it can be traced directly to the intermuscular septum between the Vastus Externus and the Adductor Magnus, and is continued thence to the capsule of the knee-joint.

[illegible]e Gluteus Medius arises from the dorsum
[illegible]surface of the aponeurosis of the G. Maxi-
[illegible] set of fascicles, from the lateral border
[illegible]e of the sacrum. Fibres pass downward
[illegible]reat trochanter. Posteriorly this muscle
[illegible]nes which anteriorly are fused. The ante-
[illegible]rigin, and is inserted into the trochanter
[illegible]is supplied by nerves in common with the
[illegible]ior is fibrous. The posterior portion,
[illegible]he anterior, arises from the sacrum and is
[illegible]ing directly from the sciatic at the great
[illegible]t is also supplied on the dorsal surface by
[illegible]he great sacro-sciatic foramen in common
[illegible]l, but distinct from it. This portion of
[illegible]d into the great trochanter as it borders
[illegible]

[illegible]parallel can be here instituted between the
[illegible] Medius. The sacral part of each muscle
[illegible]hed from the iliac portion. In the case of
[illegible]ion has gone so far as to form the outline
[illegible], but which are not completely separable
[illegible]

[illegible]The Gluteus Minimus arises from the
[illegible]ow that surface occupied by the G. Medius.
[illegible] the G. Maximus. This fusion enables the
[illegible] G. Minimus as a deep lamina of complex
[illegible] Maximus is a superficial lamina, the two
[illegible]g in this instance so remote from one
[illegible] to permit so large a muscle as the G.
[illegible]d between them. The same disposition
[illegible] witnessed in the G. Medius is also found
[illegible] superficial lamina, however, is quite rudi-
[illegible]d to the anterior fifth of the dorsal surface.
[illegible]æ passes a large trunk from the superior
[illegible]hich supplies both the G. Medius, G. Mini-
[illegible]e anterior part of the G. Maximus. The
[illegible]d in the anterior edge of the trochanter
[illegible]tening tendon, and is in close relation to
[illegible]

[illegible]*oris.*—The Tensor Vaginæ Femoris arises

from the ventral edge of the ilium on a line with and immediately posterior to the Sartorius. It arises by a thin membranous tendon on a level with the great trochanter at the middle of the thigh, and ends in the fascia lata. It does not fuse with the muscles of the Gluteal group.

The structure last named is continuous with the fibres of insertion of the Biceps Femoris at the side of the knee, but is not in a line with the head of the tibia, but rather with the side of the patella. The nerve-supply is probably from the inferior gluteal; the dissection did not permit of an exact identification.

(b) *Intrinsic Set.*

The Biceps Femoris.—The Biceps Femoris arises by a broad stout aponeurosis from a spine of the sacrum,[1] and by a musculo-tendinous mass from the tuberosity of the ischium. The muscle forms a broad sheet of fibres over the outer side of the thigh and ends in a second aponeurosis at the lateral margin of the patella, and the head of the tibia. At a point about on a level with the head of the tibia, a slender fascicle is given off that passes over the leg superficially and joins the Soleus, and with the last-named muscle contributes to the formation of the Tendo-Achillis. Beneath the Biceps lies the Tenuissimus. This arises from the under surface of the Gluteus Maximus, and passing down over the sciatic nerve is lost over the fascia of the leg.

The Biceps was found in one dissection to present variation from the above description. The body of the muscle as it arose from the ischium divided into two portions, an anterior and a posterior. The anterior, larger—and at the ischium the more superficial portion—was inserted entirely upon the side of the patella and the external tibial condyle. The posterior portion became superficial about six lines below the tuberosity, and was inserted by a broad, thin surface on the fascia of the leg, and, finally, instead of joining the Soleus, was continuous with the Gastrocnemius at the beginning of the tendo-Achillis. The Tenuissimus instead of arising from the Gluteus Maximus, arose from its tendon of insertion into the third trochanter. It passed to the posterior division of the Biceps, along the hinder border of which it descended to the fascia of the leg.

[1] In Ursus, according to the figure in Cuvier and Lieutaud, this slip is absent.

[illegible] e variations of the Biceps Femoris (Biceps
[illegible] in adapting the above description in its
[illegible] anatomy. Sömmering describes the muscle
[illegible] ad from the tuberosity of the ischium;
[illegible] ead from the upper portion of the linea
[illegible] s a head arising from the fascia beneath
[illegible] This is evidently the same as the Tenuis-
[illegible] ous proximally to the sacrum, has been
[illegible] Macalister. A slip may be attached to the
[illegible] tibia. A slip may be inserted in the fascia
[illegible] join the tendo-Achillis.

[illegible] ing to note that the muscle is variable in
[illegible] the human subject. In one specimen the
[illegible] ay be regarded as homologous with the
[illegible] uman muscle, was attached to the femur,
[illegible] seen arising from the Gluteus Maximus.
[illegible] ould indicate that the muscle is of the same
[illegible] the muscular slips passing between a super-
[illegible] le of the same group, as instanced in the
[illegible] een passing between the superficial and the
[illegible] ers. It is supplied by a separate branch
[illegible] s by branches in common with the Biceps.
[illegible] the Biceps consists of great numbers of
[illegible] the lesser sciatic and its anastomosis with
[illegible]

[illegible]—This muscle arises from the upper end
[illegible] he ischium, and by a fleshy slip from the
[illegible] he aponeurosis of the Biceps. The last-
[illegible] ain belly at its upper third. The muscle is
[illegible] or surface of the tibia at its upper third.
[illegible] lies directly beneath the tendon of insertion
[illegible]

[illegible], while arising in great measure in common
[illegible] rted on the opposite side of the limb. The
[illegible] he sciatic.

[illegible]*sus* arises from the entire posterior margin
[illegible] e, excepting a portion a few lines in length
[illegible] hich is occupied by the origin of the Adduc-
[illegible] in reality two muscles. The first of these
[illegible] as a flat band of tendinous fibres from the

tuberosity of the ischium and is inserted into the tibia at the inner tuberosity. The second—the ischio-pubio-femoral—arises from the remaining portion of the posterior margin and is inserted into the femur above the external condyle. Uniting the two is a long fusiform slip, which arises from the ischium above and is inserted with the other division into the femur.

The nerves of the Semimembranosus are numerous and large. The ischio-tibial is supplied by a distinct trunk from the great sciatic nerve. The ischio-pubio-femoral by both this nerve and the obturator. A long branch of the nerve first named runs along the femoral division to its distal third, where it anastomoses with a branch of the anterior crural nerve.

Sartorius.—The Sartorius muscle arises from the anterior superior spinous process of the ilium, by a rough angulated border equalling in length one-third of the anterior border of the ilium, and from a fibrous membrane continuous with the External Oblique muscle of the abdomen. The muscle is broad and ribbon-shaped and is inserted into the capsule of the knee-joint toward its median surface, including the median border of the patella, and passing thence downward to the tibia, where it is inserted membranously on the anterior surface, for nearly one-half the length of the shaft. On the same plane, it is in intimate union with the insertion of the Gracilis. Beneath this plane lies the insertion of the Semitendinosus. The Sartorius is supplied at its upper third by the anterior crural nerve, and at its lower fifth by a deeper-seated branch from the same nerve.

Gracilis.—The Gracilis arises tendinously from the entire length of the symphysis, and muscularly by a thickened border from the descending ramus of the pubis. It is inserted at the median side of the patella, the median tuberosity of the tibia and the corresponding border of the tibia at its proximal third. It is freely supplied both at the proximal and the distal portions by branches of the anterior crural nerve.

Adductor Magnus arises from the lower half of the symphyseal line, the pubis at the beginning of the descending ramus and the under surface of the Gracilis. It is inserted by fleshy fibres into the entire posterior surface of the distal half of the femur. The fibres of insertion form three distinct fasciculi, one, representing the median cord that in the human subject, passes to the minute tubercle above the epiphysis, but which is here fleshy and dis-

[illegible]rior surface. The remaining portions lie [illegible]gin, one of them directly upon it. The [illegible] the anterior crural and the obturator.

[illegible]ses from the symphysis and the pubic half [illegible]e. It is inserted into the femur by an [illegible]median border. It is supplied by nerves [illegible]l.

[illegible]*the Adductor Brevis* arise from the ilio-[illegible] from the bone between this line and the [illegible]oth inserted tendinously on the A. Longus, [illegible]order. Their nerves are derived from the [illegible]

[illegible]—The Rectus arises over the acetabulum [illegible]s proximal seventh the muscle is tendinous [illegible]soas. It is free throughout, except at the [illegible]ter side, where it is joined by the Vastus [illegible]ted by a sheath derived for the most part [illegible]us. On this sheath is inserted the Tensor [illegible]

[illegible] and Vastus Externus form a continuous [illegible] of the thigh, behind the Rectus. They are [illegible]its upper half; the V. Internus arises for [illegible] front of the shaft of the femur at the base [illegible]r, and by a continuous small fleshy line [illegible]of the front of the bone. It is continuous [illegible]V. Externus, V. Internus and Crureus form [illegible] is fibrous at its lower half. The nerve-[illegible]ps Extensor is derived from the anterior [illegible]ion the Vastus Externus receives four or [illegible]lesser sciatic nerve.

[illegible]—The Quadratus Femoris is a stout muscle [illegible]osity and the ramus of the ischium, and [illegible]ior surface of the femur by a rugose cres-[illegible]plied by a distinct nerve from the great [illegible]tion to the size of the muscle is unusually [illegible]

[illegible]—The Obturator Externus arises from the [illegible] foramen externally, the descending ramus [illegible]ramus of the ischium, and passes forward [illegible]don which is superficial at its distal half

into the anterior half of the digital fossa. In the anterior part of the muscle is seen an imperfect attempt at the formation of two laminæ. The tendon is here concealed to a greater degree than elsewhere. The muscle receives its nerve-supply from the obturator nerve.

Obturator Internus.—The Obturator Internus arises from the entire inner surface of the innominate bone for a distance equalling the extent of the symphysis pubis. Save at its extreme anterior margin and the trochlear surface as it winds round the border of the ischium, the muscle is fleshy throughout. Both Gemelli muscles are well developed and are fused in front of the main tendon. The muscle is intimately connected with the capsule of the hip-joint and is fused at the insertion with the tendon of the Obturator Externus. The Obturator Internus receives nerves within the pelvis from the internal pudic, and the Gemelli from a separate trunk destined for the Quadratus Femoris.

The Gemelli form a deep lamina of cleavage from the main mass of the Internal Obturator which represents a superficial layer of the same muscle.

Gastrocnemius.—This muscle arises from the femur by two heads. The outer head bears a sesamoid bone.—The fibrous tissue between the femur and this bone are exceedingly stout and coarsely fasciculated. A thin fascia-like membrane extends from the lateral surface of the capsule of the knee-joint to the superficies of the sesamoid. This is continuous with the Vastus Externus muscle, so that when traction is made upon the muscle last named the sesamoid can be moved slightly upward. This muscle, therefore, can aid in fixing the bone at times when the Gastrocnemius and the Plantaris contract. The bone is also supported by bands extending to it from the posterior surface of the capsule.—The outer head of the Gastrocnemius is pierced by a branch of the sciatic nerve to supply the Soleus on its superior surface. Fusing with the under surface of the outer head is the origin of the Plantaris muscle. The inner head is of muscular origin and ribbon-shaped, and is attached directly to the femur without the intervention of a sesamoid bone. The two heads of the muscle fuse at the upper third of the leg, forming a flat, triangular surface which gradually becomes tendinous toward the apex of the triangle to form the tendo-Achillis.[1] An unusually large bursa

[1] There is no slip of origin from the fascia over the head of the fibula as in *Felis*.

...he concave tuber calcis and the tendon.
...he Biceps muscle it has already been men-
...rocnemius may be reinforced by the lower
...—The Soleus arises from the head of the
...culo-tendinous origin. It is fusiform, much
... way more robust than the Gastrocnemius,
...chillis six lines above the tuber calcis. The
...ghout and does not receive any slip of the
... nerve supply of the Gastrocnemius is from
...eus also is supplied by a branch of the sciatic,
...Plantaris and the external head.
...as it does with the outer head of the Gastroc-
... can be traced with scarcely any artificial
...amoid bone in the outer head of the Gastroc-
...e of contact between the Plantaris and the
...rous throughout. This is seen to be different
...t in *Felis*, in which animal the Plantaris
...he fascia of the leg. The Plantaris tendon
...o the outer side of the tendo-Achillis, passes
...as a broad aponeurosis, from the distal end
...ntar surface of the foot, the Flexor Brevis
...The motion between the Plantaris and the
...torum is pronounced medianly but absent
...aris may thus be said to be inserted into the
...al surface, and the Flexor Brevis Digitorum
...me surface. On the median aspect, however,
... continuous with one another through inter-
...e. It is supplied by the sciatic nerve.
...m a shallow pit on the lateral surface of the
... ligament-like tendon, that passes in a groove
...rd to the tibia. The muscular fibres are
...heet and are inserted into the tibia for its
...roximal edge of the muscle is horizontal and
...h the tendon of origin. The distal edge is
... overlaps the fascia covering the Flexor
...e nerve supply is from the sciatic.
...*itorum* arises from the proximal half of the
...he tibia, and from the stout fascia lying on
...f the muscle. The very stout, broad tendon
... of the leg, lies in a groove behind the inter-

nal malleolus in company with the small Tibialis Posticus, and is inserted on the median side of the conjoined tendon at the tarso-metatarsal line. It receives all the fibres of the Musculus Accessorius.

Musculus Accessorius arises from the lateral aspect of the calcaneum, and is inserted on the median half of the conjoined tendon.

Flexor Longus Pollicis arises from the proximal two-thirds of the posterior surface of the shaft of the fibula, and by nearly as long a surface from the tibia. The fibres of the tendon can be traced nearly to the head of the fibula but become free only at the level of the ankle. The tendon lies in the deep recess between the tibia and the fibula, in the pronounced groove on the posterior border of the astragalus, as well as in the depression beneath the *sustentaculum tali* to unite with the conjoined tendon at its lateral half. The conjoined tendon splits into five phalangeal slips, one for each of the five toes—each tendon being inserted into the plantar tubercle of the terminal phalanx.

Lumbricales.—These are three in number and are supplied to the second, third and fourth toes. The muscle for the first toe arises from the tendon of the long flexor of the second, that for the second from the tendon of the third toe, and that for the third from the tendon of the fourth toe. These slips are inserted on the sheath of the flexor tendons, which cannot be separated from the tendon of insertion of the Extensor Longus Digitorum.

Tibialis Posticus arises from the proximal ends of both the tibia and the fibula. It passes downward parallel to and in part concealed by the Flexor Longus Digitorum, in company with the tendon of which it enters a sheath behind the internal malleolus. It is inserted into the scaphoid bone. The posterior tibial group of muscles receives its nerves from the internal popliteal nerve as it passes between the two heads of the Gastrocnemius.

Peroneus Longus arises tendinously from the lateral surface of the head of the fibula, by a head that is slightly narrower than the belly. It becomes tendinous at the middle third of the leg, thence passes through a separate sheath over the external malleolus, it lies in a groove on the calcaneum beneath the *sustentaculum tali* and is inserted into the base of the fifth metatarsal bone.

Peroneus Brevis arises broad and fleshy from the posterior

[illegible] les without reference to human anatomy, [illegible] le, and the terminology herewith employed [illegible] judgment, to that in the foregoing section. [illegible] ngeal Flexors are present in the foot of [illegible] t differentiated of these is seen in the [illegible] es. This muscle remains unspecialized as [illegible] rd of the third metatarsal bone. It then [illegible] sciculi, each of which goes to the sesamoid [illegible]. *Procyon*, as *Felis*, possesses a pair of [illegible] metatarso-phalangeal joint.—The fourth [illegible] lexor is essentially the same in plan as is [illegible] second toe, however, exhibits almost com- [illegible] ge, two short oblique bands alone uniting [illegible] muscles. The lateral half of the muscle [illegible] f the Peroneus Longus muscle, the median [illegible] under surface of the first cuneiform in [illegible] ral half of the first Metatarso-Phalangeal [illegible] last named is highly specialized, the two [illegible] hroughout, but for a small oblique fascicle [illegible] of the two muscles, the median arising as [illegible] the lateral from a supernumerary ossicle [illegible] pect of the third cuneiform bone.—The fifth [illegible] Flexor is, like the first, highly specialized [illegible] non-communicating slips, both of which [illegible] erary ossicle in the sheath of the Peroneus [illegible]

[illegible] of the same sheath sends distally three [illegible] e median is homologous with the Adductor [illegible] g two are functionally adductors to the [illegible] espectively.

[illegible]—Under this heading is appropriately in- [illegible] r fasciculus passing from the under surface [illegible] nserted into the base of the first metatarsal [illegible]

[illegible] lassification of the intrinsic muscles of the [illegible] L. Cunningham (Journ. Anat. and Physiol., [illegible] h palmar adductors, dorsal adductors and [illegible] e identified, the muscles in *Procyon* exhibit [illegible] adductors and intermediate flexors, while [illegible] re rudimentary or absent.

Concluding Remarks.—The tendency for certain muscles, as the Gluteus Medius, the Semimembranosus, the Biceps Cubiti, the Triceps, and the Masseter to undergo partial planal cleavage, *i. e.*, to form distinct laminæ at one part, while but a single lamina, embracing the entire thickness of the muscle, at another, indicates that such muscles are imperfectly differentiated, but are yet sufficiently differentiated to receive nerve-supply from separate sources.

In the process by which a muscle-sheet is changed into a muscle-thong or "cord" (premising such a process ever to take place), the sheet is folded once upon itself. The two halves of the sheet constitute the laminæ. The space between becomes the interlaminate space, and receives the nerves. This retention of a muscle-thong with the laminæ and interlaminate space as seen in many muscles of *Procyon* would indicate a lower type of muscle than any seen in *Felis*, in which genus the tendency exists for the interlaminate space to become obliterated by the fusion of the laminæ. The nerve, however, always enters the muscle at the position of the lines of fusion.

While the changes witnessed in a sheet of muscle undergoing longitudinal *cleavage* are included under the head of progressive development (as is witnessed in the evolution of special slips from the Panniculus Carnosus in the formation of the muscles of the auricle and of the face; and while similar changes are known to occur by which the great vertebro-costal masses send off partially distinct fascicles to various portions of the trunk), those witnessed in the limbs by which distinct laminæ in an early form undergo *fusion*, and thereby become complex in a later form, are to be included under the same general head. In that variety of development by which a single muscle is converted into many muscles by a process of splitting, the portions thereby formed can reunite by a process of splicing. The splitting is carried as far in *Felis* as in *Procyon*, but the splicing process is carried farther in *Felis*.

The number of nerves was found to be subject to considerable variation. Muscles of low degree of specialization such as the Latissimus Dorsi, Biceps Flexor and Semimembranosus were found richer in nerves than highly specialized muscles such as the Tibialis Anticus and the Supinator Longus. Between *Felis* and *Procyon* marked contrasts were presented between muscles of the same name—the lowly specialized muscles in all instances

[illegible] in *Procyon* than in *Felis*. The number of [illegible]minated muscle in *Procyon* becomes highly [illegible] was well exhibited in the instance of the [illegible]

[illegible]uscle-variations it has been seen that many [illegible]orrespond to abnormal muscles in man. [illegible]en noted in the text. It is equally instruc[illegible] are identical with the human muscles, such, [illegible]otators of the femur. Other muscles in [illegible] beyond the limits of variation of human [illegible] latter group may be named the continuity [illegible]he Flexor Brevis Digitorum, the accession [illegible] the Pectoralis, and the fusion between the [illegible] Pedis and the Flexor Longus Digitorum [illegible]

MAY 23.

The President, Dr. LEIDY, in the chair.

Forty-four persons present.

On Bacillus anthracis.—Prof. LEIDY stated that Dr. Robert Gladfelter, veterinary surgeon, had submitted to his examination a bottle of blood from a cow. The animal, apparently well on Wednesday, May 10th, and milked the same evening, died the next morning. The cause was not clear but was suspected to be the result of anthrax, charbon, or splenic fever. During the past year a number of cows in the same herd, had died in a similar manner, in Salem Co., N. J. A post-mortem examination was made the following day; and the abdominal viscera were found much conjested; especially the spleen, which was gorged with blood. The specimen of blood, obtained from the spleen was examined the next day, Friday. It teemed with Bacteria, the peculiar form, *Bacillus anthracis*, which is now viewed by most competent authorities as the cause of the frightful affection known as anthrax or splenic fever. The Bacilli were actually more numerous than the blood corpuscles, which appeared unchanged. The Bacilli were completely motionless; straight, bent or zigzag filaments, in the latter condition in pairs or more segments. They measured from 0.006 to 0.042 mm. in length; usually from 0.012 to 0.03 mm. Kept for some days in the blood the filaments underwent division into little chains in two, three, or more dumb-bells, which measure about 0.005 mm., or into isolated micrococci-like particles about 0.0015 mm. Many however of the filaments did not resolve themselves into these minute particles, but appeared only to grow in length and divide into segments of about 0.012 mm. in length.

On Enchytræus, Distichopus and their parasites.—Prof. LEIDY remarked that occasionally in lifting a flower-pot or in stirring the earth within, attention is sometimes attracted by the sudden wriggling of a little white worm disturbed from its rest. In the Archiv für Anatomie, 1837, Henle has given an elaborate description of the worm and named it *Enchytræus* in reference to its familliar habitation. The little pot worm is common in our vicinity, especially in damp forests under decaying leaves and timber. It was first noticed in 1773 from Denmark by O. F. Müller, and in 1880 from Greenland by Fabricius. It has also been observed in France and Germany; and therefore the little worm appears to extend over the northern parts of Europe and America.

[illegible] found in the meadows of Atlantic City, [illegible]ual haunts of *Melampus bidentatus* and [illegible]ture specimens, about three-fourths of an [illegible] is well produced, and the body has ten [illegible]dvance of it and about forty-five behind [illegible]etapeds in four longitudinal rows, are in [illegible] to each, in advance of the girdle and two [illegible]t.

[illegible] our forests I have repeatedly observed [illegible]ccupying the body cavity, sometimes in [illegible]ingled with the normal discoid corpuscles. [illegible]oplophrya modesta.* In the Enchytræus [illegible]tic City I observed a different infusorian, [illegible]ty, remarkable for its great proportionate [illegible]to name *Anoplophrya funiculus.*

[illegible]whether the latter did not likewise infest [illegible]eighboring forests I recently collected a [illegible] at Media, Del., Co., These I obtained [illegible]ying in my path to Swarthmore College. [illegible]bust specimens of *Enchytræus vermicu-*[illegible]hem to be. Investigation at home proved [illegible] generically distinct from previous known [illegible]ess but two rows of setapeds, instead of [illegible] of the family. Hoffmeister and Gruby [illegible]*hreorycies* as having only two rows of [illegible]s shown this to be an error. In view of [illegible]eated my examination of the little worms [illegible]onvinced that they possess two rows of [illegible]*ytræus* I always found four. So much do [illegible]semble the latter that it would appear as [illegible]directly evolved from *Enchytræus* merely [illegible]pair of the four rows of setapeds.

[illegible]nts the following characters and may be [illegible]anying name.

[illegible]nd color as in *Enchytræus;* with a well [illegible]eds in a single row on each side ventrally, [illegible]four in advance of the girdle and of three [illegible]

[illegible]s. Body cylindrical, white, translucent, [illegible]irdle of whiter color. Upper lip short [illegible]ent thicker than the penultimate, brownish [illegible]nquiradiate. Ten setigerous segments in [illegible]ith fascicles of usually three or four seta-[illegible]s segments behind the girdle, with usually [illegible]Oral and anal segments without setapeds. [illegible]outer than in *Enchytræus vermicularis,* [illegible]en at the middle, and straight towards [illegible] nine to fifteen lines.

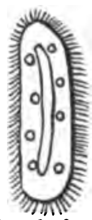
[illegible]rian in *Distichopus*, but in most of those [illegible]nd within the intestine minute Gregarines

..., *Lumbricus.* This
...pecially remarkable
... number of curved
...es. Viewing it as a
...haracterized.
...? Kölliker. Body
...lly acute,
...mammilla;
... as in gre-
... nucleolus.
...h. In the
...nct and in
...nes mostly
... These are
....0045 mm.
...lly two or
...nce of the

... the follow-

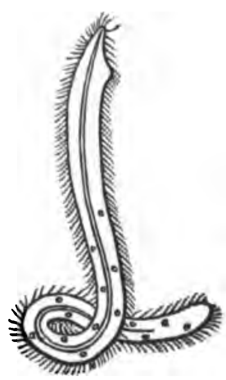
Monocystis mitis, 333 diam.

...ur. Ac. Nat. Sc. 1850,
...nteriorly
...ally from
...; nucleus
...wo-thirds
... variable
.... Length
...mm. In
...from .054
...us in the



Anoplophrya modesta, 350 diam.

...nd ulna-like in shape,



A. funiculus, 175 diam.

...ew Jersey.

[illegible] *Lumbricus*, species undetermined and [illegible] the forests in the vicinity of Philadelphia, [illegible] of the above which may be distinguished [illegible]

[illegible]RA MELO. Oval or ovoid, scarcely twice [illegible] the breadth, with the narrower pole [illegible] nucleus axial, cylindrical, sigmoid, about [illegible] length of the body; contractile vesicles [illegible] or two, or none, large. Length 0.048 mm. [illegible] breadth 0.032 to 0.04 mm. Pairs in [illegible] transverse division 0.08 by 0.036 mm. to [illegible] mm. Inhabiting the body cavity of [illegible]

[illegible] Cook, D.D., was elected Vice-President and [illegible] Curator to fill vacancies caused by the [illegible]

[illegible] was elected a member of the Council, to [illegible] by the election of the Rev. Dr. McCook to [illegible]

MAY 30.

[illegible], Dr. LEIDY, in the chair.

[illegible] present.

[illegible] its flocks of Aphis and Coccus.—Prof. [illegible] he had made a communication, published [illegible] April 10th, 1877, on the habits of the Yellow [illegible], in seeking for other animals, he had [illegible] the species is not only a common one of [illegible] it was habitual with the ant to care for [illegible] *Aphis* and *Coccus* originally noticed in [illegible] workers, of the species *Lasius interjectus*, [illegible] amber color, shining and hairy, and [illegible] metres long.[1] The Aphis is white or pale [illegible] with a white waxy secretion, has brownish [illegible] honey tubes, and is about $2\frac{1}{2}$ mm. long and [illegible] cus is red with some whitish waxy secre- [illegible] fourths to one millemetre and one-half in [illegible]

[illegible] near Swarthmore College, Del. Co., a nest [illegible] observed beneath a flat stone, about one

[1] [illegible] ication the ant was named *Formica flava*, but [illegible] determined it to be as here stated.

foot by seven inches broad. Collected on the under side of the stone there were six distinct and closely crowded groups of the white aphis and five of the red coccus. The largest aphis group was three inches by one inch; the smallest one-half inch in diameter. The largest coccus group was an inch and one-half by three-fourths of an inch, and the smallest one-half an inch by one-fourth of an inch. The ground beneath the stone was furrowed by tortuous paths communicating with holes, through which ants were running; but most of these together with their flocks were adherent to the under side of the stone, and occupied a space of about six inches by four inches.

Colorless Garnet and Tourmaline.—Prof. LEIDY further exhibited several brilliant cut specimens of garnet, from Hull, Quebec, Canada. They are transparent, with a pale yellowish tint like an off-colored diamond, and are flawless. Another specimen was a handsome colorless brilliant of achroite or tourmaline from St. Lawrence Co., New York.

JUNE 6.

The President, Dr. LEIDY, in the chair.

Thirty-three persons present.

A paper entitled "On the relative Ages and Classification of the Post-Eocene Tertiary Deposits of the Atlantic Slope," by Angelo Heilprin, was presented for publication.

The deaths of Wm. B. Rogers, a Correspondent, and Samuel P. Carpenter and Andrew C. Craig, members, were announced.

JUNE 13.

Mr. MEEHAN, Vice-President, in the chair.

Twenty-nine persons present.

The following was ordered to be printed:—

[illegible] AND CLASSIFICATION OF THE POST-EOCENE [illegible]POSITS OF THE ATLANTIC SLOPE.

[illegible] ANGELO HEILPRIN.

[illegible]ing that for a period of nearly fifty years [illegible] American tertiary formations was first [illegible], there should still have existed among [illegible]g views, not only relative to the positions [illegible]e proportion of the deposits in question in [illegible] also relative to the positions occupied by [illegible] of each other. Yet such has been the [illegible] said to be the case at the present time. [illegible]ocene deposits along the Atlantic border [illegible]s long since been recognized, and their [illegible] investigated and delineated by paleon- [illegible] ability. While the opinions expressed [illegible]s to the age of at least some of these [illegible]o have been substantially correct, yet in [illegible]iews of other geologists of no less experi- [illegible]hich were set forth and maintained with a [illegible] by the character of the research upon [illegible]t may be stated that the general outcome [illegible]ting the stratigraphy of the deposits here [illegible]at they hold a position somewhere inter- [illegible]ene and the post-pliocene series.

[illegible]ry deposits have their greatest develop- [illegible]st carefully investigated in the States of [illegible]th and South Carolina. In the frequently [illegible]. Conrad they represented over the entire [illegible] geological formation, which that geologist [illegible] the miocene, but which, at the same time, [illegible]sidered to be the equivalent of the British [illegible]niversally regarded as being of pliocene [illegible]

[illegible]o have been made to determine whether [illegible]ble to one or several faunal horizons, and [illegible]ained from them were simply classified as [illegible]ene or "medial tertiary" period. The [illegible]orth Carolina the proportion of recent to

extinct forms among the imbedded remains was greater than in either Virginia or Maryland did not escape the notice of the observer mentioned, but yet he did not hesitate to conclude (Kerr, Geological Survey of North Carolina, Appendix, p. 25, 1875) that his miocene strata represented " one contemporaneous sea bottom, holding living individuals of certain species throughout its entire length, and which is characterized by some of its species closely resembling existing ones, but many more having no affinity with American shells." How many of the fossil species were by Mr. Conrad considered to be identical with recent forms, it is impossible to determine with any amount of exactitude, since the opinions of that geologist bearing upon this point appear not to have been fixed and to have fluctuated extensively within very brief intervals of time. Thus, while in 1838 (Fossils of the Medial Tertiary Formations, Introduction, p. xvi), it is asserted that of about 200 described species 19 (or less than 10 per cent.) are still among the living fauna, in 1843 (Proc. Phil. Acad. Nat. Sciences, i, p. 328), the number of recent forms is said to be 43 out of a total of 328 described; in 1862, on the other hand, referring to the South Carolina deposits, where the percentage of recent forms had been claimed to be greater than in either of the other three states, Mr. Conrad maintains that "it may be that all the species are extinct" (Proc. Acad. Nat. Sciences, xiv, p. 559). It is further stated (*loc. cit.*) that of the entire number, 581, of miocene shells of the Atlantic stope, the number of forms that could be considered as doubtfully identical with recent species was not more than 30 (or about 5 per cent). The faunal relations existing between these so-called "medial tertiary" deposits and the deposits of the British crag and the faluns of the Loire, at that time supposed to be of nearly equivalent age, were likewise pointed out by Lyell (Journ. Geol. Society, i, pp. 413 *et. seq.*), who also did not fail to notice that in North Carolina " the recent species bore a larger proportion than usual to the extinct" (*loc. cit.*, p. 418). But this geologist, with his characteristic acuteness, further remarks: " As, however, it would be very rash to assume that all the miocene deposits of the United States, especially in countries as far apart as Maryland and South Carolina, were of strictly contemporaneous origin, the fossil faunas of each region should be carefully distinguished and considered separately " (p. 418). Of 147 species of mollusca gathered by Mr. Lyell himself, and which

[illegible] lied with the assistance of Mr. Sowerby, [illegible] er cent.) were considered to be identical [illegible] 9). In the later editions of the "Elements [illegible] 4) the deposits in question are referred to [illegible] he, but no clearly defined statement is given [illegible] the one age, and which to the other.

[illegible] examination of the South Carolina region [illegible] en made, Mr. Tuomey arrived at the con- [illegible] uth Carolina, 1848), that the post-eocene [illegible] t State belonged to the pliocene, and not [illegible] and that, consequently, they were not [illegible] he deposits (in Virginia) which had now [illegible] as typically representing the miocene of [illegible] tes. Of about 170 species of mollusca [illegible] mewhat more than 80 (or nearly 50 per [illegible] to be still living along the Atlantic and [illegible] p. 206–208). The pliocene age of these [illegible] ed by Professors Tuomey and Holmes in [illegible] s of South Carolina" (1857), where, also, [illegible] arolina (miocene of Emmons, North Caro- [illegible], 1858), are referred to the same period. [illegible] scribed invertebrate remains (mollusks, [illegible] s), 85 (or 42 per cent.) were considered to [illegible] (*op. cit.*, Introduction, IX.) The deter- [illegible] nd Holmes for both the South and North [illegible] ccepted by Dana for the several editions [illegible] his "Manual of Geology," where the [illegible] made to include the post-eocene tertiary [illegible] land, New Jersey, and Martha's Vineyard, [illegible] iod, the similar beds of North and South [illegible] k List of the Invertebrate Fossils of North [illegible] oubtless from data furnished by Conrad) [illegible] for the Smithsonian Institution (Miscella- [illegible]), all the non-eocene or oligocene tertiary [illegible] United States are classed as belonging to [illegible] nd finally, Prof. C. H. Hitchcock, in the [illegible] the United States" (1881), accepts the [illegible] for the age of the North and South Caro- [illegible] se for the Virginia deposits, and those of [illegible] land. The deposits of the Maryland east-

shore, of Delaware, and the greater portion of those in New Jersey which lie to the east and south of the "upper marl bed," and whose age has not yet been satisfactorily made out, are embraced within the pliocene (newer tertiary).

In order to facilitate the solution of the stratigraphical problem herein involved, the following faunal lists of the several States (Maryland, Virginia, North and South Carolina) have been prepared, and comparisons between them instituted. The utterly desultory and careless manner in which a very considerable portion of the paleontology of the region referred to has been worked up, has rendered their preparation a matter of great difficulty, and, indeed, if absolute accuracy is concerned, a well nigh impossibility. Not only have species been referred to several distinct genera (and families), and catalogued under their respective generic names independently of each other, but in several instances the identical specimen has been figured and redescribed under two or more forms; species, again, originally described from the deposits of one State, have been subsequently credited (and to the exclusion of the first-named locality) to the deposits of another State. Defective illustrations, and in very many cases the absence of illustrations altogether, have still further increased the difficulties, especially where the described specimens themselves are wanting, or where through an unsatisfactory diagnosis their specific (or even generic!) identification is rendered hopeless. Many of the forms here included are therefore taken on faith, and many will doubtless have to be excluded when fresh material is gathered in the field and re-studied. *Per contra*, many forms, seemingly doubtful, have been excluded, which may possibly have to be reinstated on further examination. Where it has been possible (and this has been the case for most of the forms) the original descriptions of the species have been referred to, and the localities of their occurrence there indicated have been those which have been noted; species said to occur in the deposits of several States have been traced back for re-descriptions, or to papers bearing specially on the paleontology of those States, but very little reliance being placed on general enumerations of distribution. By this means it has been hoped to render the lists as complete and free from error as could reasonably be made possible, and while, doubtless, various modifications will eventually have to be introduced, it is

[illegible] by the author that they so far represent the [illegible]rs as to permit of positive conclusions being [illegible]

[illegible] here instituted between the molluscan faunas [illegible] of the several States have been made sepa-[illegible] llibranchiata and the gasteropoda; and it [illegible] e outset that the results obtained from the [illegible] ation of these two groups of organisms have [illegible] rly confirmative of each other. The letters [illegible] of a species denote that the form is also found [illegible] es indicated by their respective characters; [illegible] in the case of the gasteropoda, that compari-[illegible] y such initial characters, are made between [illegible], and, therefore, it is not to be concluded from [illegible] single list, that a given form there designated [illegible] ing in a State whose characters are not indi-[illegible] Thus, in the South Carolina list only the North [illegible] e specially indicated, although several of these [illegible] re also found in the Virginia and Maryland [illegible], in the Virginia list, no special reference is [illegible] and forms.

[illegible] POST-EOCENE TERTIARY LAMELLIBRANCHIATA [illegible] H CAROLINA AND NORTH CAROLINA.

SOUTH CAROLINA.

[illegible]	N. C.	Arca hians = A. propatula?	Va.
[illegible]		" incile,	N. C.; Va.; M.
[illegible]	N. C.; Va.; M.	" costata,	N. C.
[illegible]		" centenaria,	N. C.; Va.; M.
[illegible]	N. C.; Va.	" rustica,	
[illegible]	N. C.	" lienosa,	N. C.
[illegible]	N. C.; Va.	= A. Floridana,	
[illegible]	N. C.; Va.; M.	" scalaris,	N. C.; Va.
[illegible]		" incongrua,	
[illegible]		" pexata,	
[illegible]	N. C.	" plicatura,	N. C.; Va.; M.
[illegible]	N. C.; Va.	(A. improcera,)	
[illegible]	N. C.	(A. æquicostata,)	
[illegible]	N. C.	(A. transversa)	
[illegible]	Va.; M.	Pectunculus subovatus,	N. C.; Va.; M.
[illegible]	N. C.	" lentiformis,	N. C.; Va.; M.

Pectunculus passus, N. C.; Va.
" quinquerugatus, N. C.
" lævis,
" aratus, N. C.
" transversus,
Yoldia limatula, N. C.; Va.; M.
Leda acuta, N. C.; M.
Nucula proxima,
= N. obliqua, N. C.; Va.; M.
Lucina contracta,
= L. filosa, N. C.; Va.; M.
anodonta, N. C.; Va.; M.
Pennsylvanica, N. C.
radians,
= L. Antillarum, N. C.
squamosa,
= L. pecten, N. C.; Va.
cribraria, M.
divaricata, N. C.; Va.; M.
costata,
crenulata, N. C.; Va.; M.
multilineata, N. C.
trisulcata,
Cardium Carolinense,
= C. magnum? N. C.
" muricatum, N. C.
" sublineatum, N. C.; Va.
Cardita arata, N C.; Va.; M.
" granulata, N. C.; Va.; M.
" tridentata, N. C.?
" carinata, N. C.
" perplana, N. C.
" abbreviata, N. C.
Astarte undulata, N. C.; Va.; M.
" bella, N. C.
Gouldia lunulata, N. C.; Va.
Crassatella undulata, N. C.; Va.; M.
" Gibbesii, N. C.
Cyrena densata, N. C.; Va.
Rangia clathrodonta, N. C.; Va.
Venus Rileyi, N. C.; M.
Venus mercenaria, N. C; Va.?; M.?
" athleta, N. C.
" tridacnoides, N. C.; Va.; M.
" fermagna, Va.; M.?
Cytherea subnasuta, M.
" reposta, N. C.; Va.
" Sayana, N. C.; Va.; M.
" cribraria, N. C.
= C. punctulata?
" cancellata,
Circe metastria, N. C.; Va.
Artemis intermedia, N. C.
Petricola pholadiformis,
Tellina biplicata, N. C.; M.
" alternata, N. C.
" lusoria, N. C.; Va.
" polita, N. C.
Strigilla flexuosa, N. C.
Psammocola Pleiocena,
Cumingia tellinoides, Va.
Amphidesma carinata, M.
" equalis, N. C.
" orbiculata,
" æquata, N. C.
Donax variabilis, N. C.?
Standella fragilis, N. C.?
Mactra similis, N. C.
= M. solidissima,
" lateralis, N. C.
" congesta, N. C.; Va.;
Pandora trilineata, N. C.? Va.
Panopæa reflexa, N. C.; Va.; M.
Corbula cuneata, N. C.; M.
" inequale, Va.; M.
Pholadomya abrupta, N.C.; Va.; M.
Solecurtus Caribæus, N. C.
Solen ensis, N. C.; M.
Pholas costata, N. C.; Va.? M.?
" oblongata, N. C.
" Memmingeri, N. C.

NORTH CAROLINA.

Anomia ephippium, S. C.
Ostrea Virginiana, S. C.; Va.; M.
Pecten comparilis, S. C.
Pecten eboreus, S. C.; Va.
" Clintonius, Va.; M.
= P. Magellanicus.

[illegible] S. C.
[illegible] S. C.
[illegible] Va.; M.
[illegible] Va.; M.
[illegible]
[illegible] S. C.; Va.; M.
[illegible] S. C.
[illegible]
[illegible] S. C.
[illegible] S. C.; Va.
[illegible] S. C.; Va.
[illegible]
[illegible] S. C.
[illegible]
[illegible] Va.
[illegible] S. C.; Va.
[illegible] S. C.; Va.; M.
[illegible] S. C.; Va.; M.
[illegible] S. C.
[illegible] Va.; M.
[illegible] S. C.: M.; Va.
[illegible]
[illegible]
[illegible],
S. C.; Va.; M.
[illegible]nis,
S. C.; Va.; M.
[illegible] S. C.
[illegible]us.
[illegible] S. C.; Va.
[illegible]usis.
[illegible]rugatus, S. C.
[illegible] S. C.; M.
[illegible] S. C.; Va.; M.
[illegible] S. C.; Va.; M.
[illegible]
[illegible], S. C.
[illegible] S. C.; Va.; M.
[illegible]
[illegible] S. C.; Va.; M.
[illegible] S. C.: Va.; M.
[illegible] S. C.
[illegible]um.
[illegible] S. C.; Va.; M.
[illegible] S. C.
[illegible] S. C.; Va.
[illegible]

Loripes elevata.
Mysia Americana (accliuis).
Cardium Carolinense, S. C.
= C. magnum?
" muricatum, S. C.
" sublineatum, S. C.; Va.
Glycocardia granula.
Isocardia fracterna, Va.; M.
Cardita arata, S. C.; Va.; M.
" perplana, S. C.
" granulata, S. C.; Va.; M.
" abbreviata, S. C.
" tridentata, S. C.
" carinata, S. C.
Pleuromeris decemcostata.
Astarte bella, S. C.
" clathra.
" undulata, S. C.; Va.; M.
" curta.
Gouldia lunulata, S. C.; Va.
Crassatella undulata, S. C.; Va.; M.
" Gibbsii, S. C.
" Marylandica. M.
" melina, Va.; M.
Verticordia, sp.?
Cyrena densata, S. C.; Va.
Rangia clathrodonta, S. C.; Va.
Venus mercenaria, S. C.; Va.? M.?
" tridænoides, S. C.; Va.; M.
" Rileyi, S. C.; M.
" alveata, Va.; M.
" latilirata, Va.
" athleta, S. C.
Cytherea Sayana, S. C.; Va.; M.
" reposta, S. C.; Va.
" cribraria, S. C.
= C. punctulata?
Circe metastria, S. C.; Va.
Artemis transversus.
= A. intermedia? S. C.
" acetabulum, Va.; M.
Tellina biplicata, S. C.; M.
" lusoria, S. C.; Va.
" alternata, S. C.
" polita, S. C.
" arctata.

Strigilla flexuosa,	S. C.	Pandora trilineata?	S. C.; Va.
Amphidesma æquata,	S. C.	Panopæa reflexa,	S. C.; Va.; M.
" equalis,	S. C.	Corbula cuneata,	S. C.; M.
Mulinia variabilis.		Pholadomya abrupta,	S. C.; Va.; M.
Mactra congesta,	S. C.; Va.	Solecurtus Caribæus,	S. C.
" oblongata, = Standella fragilis?	S. C.?	Solen ensis,	S. C.; M.
" lateralis,	S. C.	Pholas costata,	S. C.; Va.? M.?
" similis, = M. solidissima.	S. C.	" oblongata,	S. C.
Donax, sp.?		" Memmingeri,	S. C.

An examination of the preceding lists shows that of about 103 forms of lamellibranchiate mollusks found in the South Carolina deposits no less than 74–78 (or about 74 per cent.) are also found in the deposits of North Carolina; these last being represented by an almost equal number (106) of specific forms, the relative percentages of those common to the two States will necessarily be nearly identical. We have thus *prima facie* evidence that the deposits characterized by these remains belong very nearly, if not absolutely, to the same geological horizon. On the other hand, of the South Carolina forms at most only 43 (or 42 per cent.) are indicated as being found in Virginia, and a still smaller number, 34 (or 33 per cent.) in Maryland. We have here, therefore, strong evidence tending to prove that the deposits of the last mentioned States represent a horizon different from those indicated by the deposits of South Carolina. Similarly, of the 106 North Carolina species, at most only 48 (or 46 per cent.) are common to Virginia, and 36 (or 34 per cent.) to Maryland, a result that strikingly confirms the conclusion that has just been drawn.

Passing now to the examination of the Virginia lamellibranchiates, we find, as is shown in the following table, a total of about 109 specific forms:

VIRGINIA.

Anomia Ruffini.		Pecten Virginianus.	
Ostrea sculpturata.		" tricenarius.	
" disparilis.		" Jeffersonius,	N. C.; M.
" Virginiana,	S. C.; N. C.; M.	" dispalatus.	
" subfalcata.		" septemnarius,	S. C.; M.
Pecten fraternus.		" Clintonius, = P. Magellanicus.	N. C.; M.
" Rogersi.		" eboreus,	S. C.; N. C.
" biformis.			

Astarte (Euloxa) latisulcata.
" arata.
" Coheni.
" concentrica.
" lineolata.
" symmetrica.
Gouldia lunulata, S. C.; N. C.
Crassatella undulata, S. C.; N. C.; M.
" melina, N. C.; M.
Cyrena densata, S. C.; N. C.
Rangia clathrodonta S. C.; N. C.
Venus capax.
" ascia?
" latilirata. N. C.
" mercenaria? S. C.; M.?
" permagna, S. C.; M.?
" alveata, N. C.; M.
" Rileyi, S. C.; N. C.; M.
" tridacnoides, S. C.; N. C.; M.
Circe metastria, S. C.; N. C.
Cytherea obovata.
" reposta, S. C.; N. C.
" Sayana, S. C.; N. C.; M.
" densata.
" Virginica.
" cortinaria.
Artemis acetabulum, N. C.; M.
Petricola centenaria, M.
Tellina declivis.
" egena.
" lusoria, S. C.; N. C.
Abra subreflexa.
Cumingia tellinoides, S. C.
Mactra modicella.
" delumbis, M.
" congesta, S. C.; N. C.
" triquetra.
Thracia transversa.
Anatina antiqua.
Pandora crassidens, S. C.; N. C.
= P. trilineata.
" aremosa.
= P. trilineata?
Mya producta, M.
" corpulenta.

Poramya subovata.
Corbula inequale, S. C.; M.
Pholadomya abrupta, S. C.; N. C.; M.
Panopæa reflexa, S. C.; N. C.; M.
Solen magnodentatus ?
Saxicava bilineata, M.
= S. rugosa.
Saxicava pectorosa.
Pholas (?) rhomboidea.
" acuminata, S. C.? N. C.? M.?
= P. costata ?
Teredo fistula.
Gastrochæna ligula.

NOTE.—The following species described by H. C. Lea (Trans. Amer. Philos. Soc. IX, new series), based upon young shells, or upon such as barely admit of characterization, have been omitted from the enumeration: *Avicula multangula, Anatina tellinoides, Cytherea elevata, C. spherica, Leda acutidens, L. carinata, Modiola spinigera, Mya reflexa, Nucula dolabella, N. diaphana, Panopea dubia, Petricola compressa, Pecten micropleura, P. tenuis, Plicatula rudis, Psammobia lucinoides, Teredo calamus.*

Of these 109 species, as has already been stated, at most only 43 (or 40 per cent.) are common to South Carolina, and about 48 (or 44 per cent.) to North Carolina. Compared with the Maryland deposits the proportion of forms common to the two states is found to be not very different from the proportions just indicated, or about 38 per cent. (about 41 species).[1]

From the so-called "medial tertiary" of Maryland there have thus far been described about 98 species of acephalous mollusks:—

MARYLAND.—NEWER GROUP.

Amphidesma carinata, S. C.
" subovata,
Arca idonea, N. C.; Va.
" incile, S. C.; Va.
" centenaria, S. C.; Va.
" improcera, S. C.; N. C.; Va.
Artemis acetabulum, N. C.; Va.
Astarte vicina ?
" cuneiformis,
" perplana,
" obruta,
" undulata, S. C.; N. C.; Va.
Cardita arata, S. C.; N. C.; Va.
" protracta,
" granulata, S. C.; N. C.; Va.
Cardium laqueatum, Va.
Corbula cuneata, S. C.; N. C.;
" idonea
" inequalis, S. C.; Va.
Crassatella Marylandica, N. C.
" undulata, S. C.; N. C.; Va.
Cytherea Sayana, S. C.; N. C.; Va.
" albaria,
" Marylandica,
" staminea,
Isocardia fraterna, N. C.; Va.
Leda acuta, S. C.; N. C.
" concentrica,
Yoldia lævis, S. C.; N. C.; Va.
= Y. limatula,

[1] The Maryland deposits, in the comparisons thus far, have for convenience been taken to represent one geological horizon; their division into two groups, and the relations of each of these groups with the deposits of the several other States, are specially considered further on.

[illegible] N. C.; Va.
[illegible]
[illegible]
[illegible] N. C.; Va.
[illegible]
[illegible] S. C.
[illegible] N. C.; Va.
[illegible]
[illegible] N. C.; Va.
[illegible]
[illegible]
[illegible]
[illegible] Va.
[illegible] Va.
[illegible] N. C.; Va.
[illegible]
[illegible] N. C.; Va.
[illegible]
[illegible] N. C.; Va.
[illegible] N. C.; Va.
[illegible] N. C.; Va.
[illegible] S. C.; Va.

Pectunculus subovatus, S. C.; N. C.; Va.
Petricola centenaria, Va.
Plicatula marginata, S. C.; N. C.; Va.
Pholadomya abrupta, S. C.; N. C.; Va.
Pholas ovalis. S. C.? N. C.? Va.? = P. costata?
Saxicava rugosa, Va.
Solen ensis, S. C.; N. C.
Tellina æquistriata,
" biplicata, S. C.; N. C.
Venus tetrica,
" permagna? S. C.; Va.
" alveata, N. C.; Va.
" inoceriformis,
" tridacnoides, S.C.; N.C.; Va.
" mercenaria? S.C.; N.C.; Va.?
" Rileyi, S. C.; N. C.; Va.
" cuneata.

[M]ARYLAND.—OLDER GROUP.

[illegible]
[illegible]
[illegible]
[illegible]
[illegible] N. C.; Va.
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] Va.; N. C.
[illegible]
[illegible] S. C.
[illegible]
[illegible]
[illegible]
[illegible]

Lucina subplana,
" crenulata, S. C.; N. C.; Va.
Modiola Ducatellii,
Mytilus incurva,
Pecten Humphreysianus,
" Madisonius, N. C.; Va.
Pectunculus parilis,
" lentiformis, S. C.; N. C.; Va.
Perna maxillata, Va.
Pholas costata? S. C.; N. C.; Va. (P. ovalis.)
Panopæa porrecta,
Tellina lenis,
Venus Mortoni? (V. cuneata?)
" alveata, N. C.; Va.

[illegible] formerly credited to this State have been inten[illegible] not being sufficient evidence to prove their [illegible]

Of these 98 about 34 (35 per cent.) are common to South Carolina, 36 to North Carolina (37 per cent.), and 41 to Virginia (42 per cent.). It has, however, been shown in a previous paper (Heilprin, Proc. Acad. Nat. Sciences, 1880, pp. 20, *et. seq.*) that the Maryland deposits actually represent two distinct horizons—respectively designated (temporarily) as the "newer" and "older" groups—and, therefore, in order to have a proper appreciation of the value of these proportions it will be necessary to consider the two divisions in their relations to the several States separately.

The deposits of the "newer" group, as will be seen from the preceding enumeration, contain 66 species, and those of the "older" group, 32 species. Of the former about 33 (50 per cent.), and a nearly equal number, 32 (49 per cent.), are common respectively to South and North Carolina, whereas of the latter, only 4 (13 per cent.) are found in the first named State, and 7 (22 per cent.), in the second.[1] While the "newer" group shows a considerably higher percentage of forms common to both South and North Carolina than the deposits of the State treated as a whole, this percentage is still less than that which might naturally be expected to exist between formations (removed by about equal distances) representing an equivalent age. The rational inference is, therefore, that the deposits in question are not of contemporaneous formation. Compared with the deposits of Virginia the fauna of the "newer" group shows a somewhat more decided relation than to the deposits of the States just mentioned, for we now find the percentage of common forms increased to 56 (37 species). But even with this figure it would be rash to insist upon an equivalency being proved. Nor is the relation of the "older" group to the Virginian formation much more pronounced than it is to the North Carolinian, but no special deductions from agreements or differences of percentages can be made in this instance, since the number of both common and restricted forms is very limited.

The conclusions reached from the examination thus far of the lamellibranchiate fauna are: That the South and North Carolina formations represent one and the same horizon, and one distinct from the horizon or horizons indicated by the Virginia and Maryland formations. It now remains to be determined what

[1] These proportions strikingly corroborate the author's original assumption of two distinct horizons, based upon an examination of Maryland fossils alone.

... receives from the study of the fossil ... to the faunas of existing seas, and to ... same means what relation the various ... each other.

... FOUND FOSSIL IN THE SOUTH CAROLINA DEPOSITS.[1]

... (A. Conradi).

... Floridana.

... (Yoldia) ... (Leda lævis).

... = N. obliqua.

... = L. filosa.

... nica.

... L. Antillarum.

... (L. speciosa) = L. pecten.

... (L. Conradi).

... = C. magnum ?

... m.

... = C. punctulata ?

... a (C. cingenda).

... rmis.

... es.

... a) equalis.

... (Semele) orbiculata.

... (Mactra oblongata).

[1] ... express his indebtedness to Mr. George W. ... kind assistance most of the comparisons with ...

Mactra similis. = Hemimactra solidissima.
" lateralis.
Salecurtus Caribæus (Siliquaria Carolinensis).
Solen ensis (S. directus).
Pholas costata (P. arcuata).
" (Dactylina) oblongata (P. producta).

NOTE.—About ten other species have been considered by various authors to be equivalents of recent forms, but since their identification as such has been at best but very doubtful, and in most cases strictly erroneous, they have been omitted. Among these are:

Lucina anodonta, at one time considered by Mr. Conrad to be identical with a species living along the Florida coast. Although very closely resembling the *L. Floridana*, it may, nevertheless, be readily distinguished from it by the greater thickness of its shell, and the greater profundity of the lunules.

Cardita arata.—This species differs, as stated by Conrad (Mioc. Foss., p. 12), from the recent *C. Floridana* of the Florida coast in being proportionately longer and broader behind, and in having the ribs crossed by "crowded subsquamose transverse wrinkles," instead of "thick transverse tubercles."

Cardita granulata.—According to Conrad (Mioc. Foss., p. 13), this shell "so nearly resembles *C. borealis*, a recent species of the eastern coast, that I think it will prove to be the same, when more specimens of the latter shall be obtained for comparison." This identification, which was subsequently rejected by Conrad himself, has for its support the very similar general appearance presented by the two shells in question, but closer examination shows the *C. granulata* to be almost invariably a considerably more elevated (less rotund) form than the *C. borealis*.

Artemis intermedia.—Not readily confoundable with either the *A. concentrica* (Born) or *A. Floridana* (Conr.).

Cytherea Sayana.—More produced (less rounded) than the recent *C. convexa*.

Rangia clathrodonta.—More elongated than the recent *R. cyrenoides*.

Admitting both the positive and somewhat doubtful forms from the above list to be recent, then we have as a proportion to extinct forms 40 to 103, or 39 per cent.; or, if the six doubtful ones are omitted, 34 to 103, or 33 per cent.

The following recent species may be considered to occur in the North Carolina deposits.

Anomia ephippium.
Ostrea Virginiana.
Pecten Clintonius = P. Magellanicus.
Arca lienosa = A. Floridana.
Leda acuta.
Yoldia limatula (Leda lævis).
Nucula proxima = N. obliqua.
Chama arcinella.

[illegible]

[illegible]e = C. magnum ?

[illegible]n.

[illegible]ca.

[illegible]L. filosa.

[illegible]

[illegible] Antillarum.

[illegible]. Conradi).

[illegible] speciosa) = pecten.

[illegible]

[illegible] C. punctulata ?

[illegible]

[illegible] Standella fragilis.

[illegible]

[illegible]emimactra solidissima.

[illegible]

[illegible]s (Siliquaria Carolinensis).

[illegible]rcuata).

[illegible]oblongata.

[illegible]

[illegible]h constitute 30 per cent. of the lamelli-[illegible]tate, all, with only one exception—*Pecten* [illegible]s)—also occur in the South Carolina [illegible]percentage of recent forms in the North [illegible]us shown to be considerably lower than [illegible]view of the very strong correspondence—[illegible]lentity—existing between the two faunas [illegible]can scarcely be taken to affect the con-[illegible]t as to the contemporaneity of the two [illegible]

[illegible]forms) the number of recent species, [illegible]ul ons, is reduced to 16, as exhibited in [illegible]ration :

[illegible]

[illegible] P. Magellanicus.

[illegible] lienosa (*et* A. Floridana) ?

[illegible]

[illegible]N. proxima.

[illegible]

Lucina squamosa (L. speciosa) = L. pecten.
" crenulata
" divaricata.
" contracta = L. filosa.
? Venus mercenaria.
Tellina lusoria.
Cumingia tellinoides.
Pandora crassidens = P. trilineata.
Saxicava bilineata = S. rugosa.
? Pholas acuminata = P. costata ?

The percentage (15) is here, therefore, brought down considerably lower than in either of the preceding States, a circumstance not only strikingly confirming the assumption of non-contemporaneity (as has already been drawn from comparisons made between the different faunas themselves) in the deposits in question, but equally proving that the Virginia deposits are anterior (older) in date to those of both South and North Carolina.

The number of recent species occuring in the Maryland deposits taken as a whole (*i. e.*, as embracing both the "newer" and "older" groups, and comprising consequently 98 specific forms of acephalous mollusks) is somewhat less than in Virginia, namely (including two or three doubtful forms), 13 :

Leda acuta.
Yoldia limatula (Leda lævis).
Nucula proxima = N. obliqua.
Lucina crenulata.
" contracta = L. filosa.
" divaricata.
Ostrea Virginiana.
Pecten Clintonius = P. Magellanicus.
Panopea Americana.[1]

[1] I have here provisionally included the *Panopæa Americana* among the recent forms, although I am somewhat doubtful as to its right to a place there. The shell certainly very greatly resembles that of the recent *P. Aldrovandi* from the Mediterranean, from which, in fact, it appears to differ only in the form of the posterior truncature, which in the recent species carries up the hinge line to a higher level than in the fossil. While the form of the American shell is very constant, that of the European is stated to be very varying, and therefore the distinction pointed out may on a closer examination between specimens be found to have no specific value. By Searles Wood ("Monograph of the Crag Mollusca," ii, p. 283, Palæontogr. Soc. Reports) the *P. Americana* (and *P. reflexa*) is considered identical with the *P. Faujasii* (more properly *P. Menardi*), a common

[illegible]s.

[illegible]s

[illegible]S. bilineata).

[illegible] costata ?

[illegible]re found in the deposits of the "newer" [illegible] constitute about 18 per cent. of its lamelli- [illegible] other hand, at most, only 2 occur in the [illegible] group. We have here, therefore, not only [illegible] of the existence in the State of two [illegible]hat might almost be considered positive [illegible] Maryland formation ("newer" group), [illegible] nearly identical with that of the (or the [illegible]nia formation, and one considerably lower [illegible] the South and North Carolina deposits, [illegible]nce that the general relations existing [illegible] faunas in the two cases are not very [illegible]

[illegible]ent summarizes the results obtained from [illegible] lamellibranch fauna :

[illegible] Carolina species—

[illegible]d in North Carolina = 74 per cent.

[illegible]n Virginia = 42 per cent.

[illegible]n Maryland = 33 per cent.

[illegible]nt = 33–39 per cent.

[illegible]arolina species—

[illegible]d in South Carolina = 74 per cent.

[illegible]n Virginia = 46 per cent.

[illegible]n Maryland = 34 per cent.

[illegible] = 30 per cent.

[illegible]a species—

[illegible]n South Carolina = 40 per cent.

[illegible]n North Carolina = 44 per cent.

[illegible]n Maryland = 38 per cent.

[illegible] = 15 per cent.

[illegible]which had frequently been confounded with the [illegible]t the American species appears to be at least as [illegible] so, to the living form. The *P. reflexa* is stated [illegible]*ématique des Foss. des Terr. Tert.*, ii, pp. 25 and [illegible]st of New Zealand, and to be identical with the [illegible] angulation on the posterior slope of the latter, [illegible]shes the two.

Of about 98 Maryland species—
- 34 are found in South Carolina = 35 per cent.
- 36 are found in North Carolina = 37 per cent.
- 41 are found in Virginia = 42 per cent.
- 13 are recent = 13 per cent.

Of about 66 Maryland "Newer" group species—
- 33 are found in South Carolina = 50 per cent.
- 32 are found in North Carolina = 49 per cent.
- 37 are found in Virginia = 56 per cent.
- 12 are recent = 18 per cent.

Of about 32 Maryland "Older" group species—
- 4 are found in South Carolina = 13 per cent.
- 7 are found in North Carolina = 22 per cent.
- 8 are found in Virginia = 25 per cent.
- 2 are recent = 7 per cent.

The examination of the gasteropod faunas of the several States, as will be seen from the summary further on, very strongly confirms the results that have been obtained from the investigation of the acephalous mollusks.

The following enumeration exhibits the species that have been described from the deposits of South and North Carolina.

South Carolina.

Cancellaria reticulata,	N. C.
" depressa.	
" venusta.	
Conus adversarius,	N. C.
" diluvianus,	N. C.
Crucibulum multilineatum,	N. C.
" costatum,	N. C.
" ramosum,	N. C.
" dumosum,	N. C.
Cypræa Carolinensis,	N. C.
Crepidula fornicata,	N. C.
" spinosa,	N. C.
— C. aculeata.	
" plana,	N. C.
— C. unguiformis.	
" costata.	
Columbella avara.	
Dentalium attenuatum,	N. C.
— D. dentale.	
Dentalium Pliocenum.	
" thallus,	N. C.
Dolium galea.	
Ecphora quadricostata,	N. C.
Fasciolaria distans,	N. C.
— F. tulipa.	
" (?) gigantea.	
" Tuomeyi.	
Fulgur carica,	N. C.
" perversus,	N. C.
" canaliculatus,	N. C.
" Conradi (incile).	
" Carolinensis.	
(F. excavatus),	N. C.
" pyrum.	
(F. spiratus),	N. C.
Ficus reticulatus,	N. C.
Fusus exilis,	N. C.
Fissurilla redimicula,	N. C.

[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible], N. C.
[illegible]um, N. C.

Purpura tridentata.
Petaloconchus sculpturatus, N. C.
Ranella caudata, N. C.
Scalaria multistriata, N. C.
" clathra, N. C.
— S. angulata.
Solarium perspectivum.
Terebra Carolinensis, N. C.
" unilineata, N. C.
Trivia pediculus, N. C.
Turritella striata.
" exaltata.
" Burdenii, N. C.
" Etiwaensis, N. C.
Trochus philantropus, N. C.
" armillatus.
" gemma.
Urosalpinx cinerea.
Voluta mutabilis, N. C.
" Trenholmii, N. C.
Vermetus anguina.

North Carolina.

[illegible], S. C.
[illegible], S. C.
[illegible], S. C.
[illegible], S. C.
[illegible], S. C.
[illegible], S. C.
[illegible], S. C.
[illegible], S. C.
[illegible], S. C.
[illegible], S. C.
[illegible], S. C.

Dentalium attenuatum, S. C.
— D. dentale.
" thallus, S. C.
Dolium octocostatus.
Ecphora quadricostata, S. C.
Eulima (?) lævigata.
Erato lævis?
Fasciolaria distans, S. C.
— F. tulipa.
" elegans.
" Sparrowi.
" alternata.
" nodulosa.
" acuta.
Fulgur carica, S. C.
" contrarius.
= F. perversus, S. C.
" canaliculatus, S. C.
? F. rugosus.
" Carolinensis.
= F. excavatus, S. C.

Fulgur pyrum.	
= F. spiratus,	S. C.
Ficus reticulatus,	S. C.
Fusus exilis,	S. C.
" equalis.	
" lamellosus.	
" moniliformis.	
Fissurella redimicula,	S. C.
Galeodia Hodgei,	S. C.
Infundibulum centralis,	S. C.
Littorina lineata.	
Marginella limatula,	S. C.
" oliviformis,	S. C.
" constricta.	
" ovata.	
" inflexa.	
" elevata.	
Mitra Carolinensis,	S. C.
Murex umbrifer,	S. C.
" globosa.	
Natica heros,	S. C.
" duplicata,	S. C.
" canrena,	S. C.
" fragilis.	
" percallosa.	
" Emmonsii.	
Nassa vibex,	S. C.
" trivittata,	S. C.
" obsoleta,	S. C.
" (Tritia) multilineatum.	
" " moniliformis.	
" " bidentata.	
Obeliscus arenosa,	S. C.
Oliva literata,	S. C.

Oliva ancillariæformis.	
" canaliculata.	
Pleurotoma lunata,	S. C.
" limatula.	
" communis.	
" elegans.	
" tuberculata.	
" flexuosa.	
Ptychosalpinx porcinum,	S. C.
" multirugatum,	S. C.
Petaloconchus sculpturatus,	S. C.
Pyramidella reticulata.	
Ranella caudata,	S. C.
Scalaria multistriata,	S. C.
" clathra,	S. C.
" curta.	
Terebra Carolinensis,	S. C.
" unilineata,	S. C.
" neglecta.	
Tornatina cylindra.	
Trivia pediculus,	S. C.
Turritella Burdenii,	S. C.
" Etiwænsis,	S. C.
" constricta.	
Turbonilla reticulata.	
Trochus philantropus,	S. C.
Voluta mutabilis,	S. C.
" Trenholmii,	S. C.
" obtusa.	
Helix tridentata.	
" labyrinthica.	
Planorbis bicarinatus.	
Paludina subglobosa.	

A comparison of the two preceding tables shows, that of the 74 South Carolina forms no less than 52 (or 70 per cent.) are common to the deposits of North Carolina, a proportion very nearly identical with that which obtains in the case of the acephalous mollusks (74 per cent.). This very close agreement leaves but little, if any, room for doubt as to the contemporaneity of the formations of the two States. In North Carolina the number of specific forms described is considerably in excess of that from the former State, and consequently, as must almost necessarily follow, the percentage of common forms is here very materially reduced.

[illegible]—4 of which are non-marine—only 52, as [illegible] in South Carolina, or just 52 per cent. [illegible]e, however, that were the number of species [illegible] Carolina equal to that from North Carolina [illegible]s common to the two States while it would [illegible] very materially from what we now find it in [illegible] d be considerably raised for the latter. On [illegible] the reverse result presents itself when a com[illegible] the Virginia fauna, which comprises a far [illegible] species than is to be found in any other State:

VIRGINIA.

[illegible]
[illegible]
[illegible] costulata.
[illegible] acava.
[illegible] lipara).
[illegible] obliqué-striata.
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] S. C.
[illegible] C.; N. C.
[illegible] C.; N. C.
[illegible]
[illegible]
[illegible]
[illegible] C.; N. C.
[illegible] pileolus).
[illegible] C.; N. C.
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible] N. C.
[illegible]
[illegible]
[illegible]
[illegible] ubula, N.C.
[illegible] carata.
[illegible] burnea.

Dentalium thallus, S. C.; N. C.
" attenuatum, S.C.; N.C.
= D. dentale.
Delphinula trochiformis.
" (Carinorbis) arenosa.
" lyra.
Ecphora quadricostata, S.C.; N.C.
Eulima (Pasithea) lævigata, N.C.
" eborea.
" migrans.
Eulimella (Pasithea) ovulum.
(E. diaphana).
Fasciolaria parvula.
" rhomboidea,
S. C.; N. C.
= F. distans.
Fissurella redimicula, S. C.; N. C.
" catilliformis.
Fulgur carica, S. C.; N. C.
" canaliculatus, S. C.; N. C.
" incile (Conradi), S. C.
" tritonis.
" filosus.
" carinatus.
" maximus.
Fusus (Neptunea) exilis,
S. C.; N. C.
" strumosus.
" (Neptunea) trossula.
Marginella limatula, S. C.; N. C.
" perpusilla.
" conulus.
" exilis.

Marginella eburneola.
Mangelia Virginiana.
Menestho limnea.
Melampus (?) longidens.
Nassa trivittata, S. C.; N. C.
" impressa.
" (Tritia) altilis.
" " bilix.
" " laqueata.
Natica duplicata, S. C.; N. C.
" heros, S. C.; N. C.
" aperta, N. C.
(N. fragilis?).
" sphærula, N. C.
(N. percallosa?).
" perspectiva.
Niso lineata.
Oliva canaliculata, N. C.
" ancillariæformis, N. C.
" Carolinensis.
= O. literata, S. C.; N. C.
" eborea.
Obeliscus arenosa, S. C.; N. C.
(Pyramidella suturalis).
Odostomia (Actæon) granulatus.
" (?) globosus.
" " turbinatus.
" " angulatus.
" " glans.
" " sculptus.
" " nitens.
Patella acinaces.
Petaloconchus sculpturatus,
S. C.; N. C.
Pleurotoma lunata, S. C.; N. C.
" pyrenoides.
" (Drillia) multisecta.
" " arata.
" " bella.
" " distans.
" " dissimilis.
" " eburnea.
" " impressa.
" (Surcula) engonata.
" " nodulifera.
Pleurotoma (Surcula) tricenaria.
" " Virginiana.
Pyramidella elaborata.
Ptychosalpinx porcinum,
S. C.; N. C.
Rotella nana.
" subconica.
" carinata.
" lenticularis.
" umbilicata.
Scalaria clathra, S. C.; N. C.
" = S. angulata.
" acicula.
" micropleura.
" microstoma
(S. cornigera?).
" pachypleura.
" procera.
Solarium nupera.
Trochus philanthropus, S.C.; N.C.
" armillus.
" conus.
" lens.
" torquatus.
" Ruffinii.
" bellus.
" labrosus.
" Mitchelii.
Turbo rusticus.
" (Monilea) caperata.
Trophon tetricus.
Turritella variabilis.
" indenta.
" plebeia.
" alticosta.
" flexionalis.
" terstriata.
" bipertita.
Trochita (Infundibulum)
concentrica.
Triforis (Cerithium) monilifera.
Urosalpinx cinerea.
Vermetus convolutus.
Voluta mutabilis, S. C.; N. C.
Vivipara (Turbo) glaber.

NOTE.—Several species described by H. C. Lea (Amer. Philos. Trans.,

[illegible] ed to have been founded on insufficiently determined [illegible] immature forms of previously described species, [illegible] itted.

[illegible] 41 species here enumerated only about 26 [illegible] ts of South Carolina, which would give to [illegible] ely low percentage of common forms (35), [illegible] ss than that (42) which was found to exist [illegible] ollusks were taken as the basis of com- [illegible] mber of Virginia forms (31) occurring in [illegible] ore numerous, and here, likewise, the per- [illegible] y lower than was found to be the case (46) [illegible] comparison. Taking these various facts [illegible] dantly conclusive as to the correctness of [illegible] n the testimony of the lamellibranchs, that [illegible] epresent a horizon different from that indi- [illegible] North Carolina formations.

[illegible] deposits taken as a whole, *i. e.*, as com- [illegible] er" and "older" groups, there have thus [illegible] t 105 species of gasteropodous mollusks; [illegible] from the following table, about 21 (20 per [illegible] outh Carolina, and 26 (or 25 per cent.) in [illegible] proportion of forms common to the two [illegible] be very limited in either case, and decidedly [illegible] exist among the lamellibranchs, there is yet [illegible] in the lamellibranch comparisons) a slight [illegible] Virginia.

[illegible] YLAND—NEWER GROUP.

[illegible]		Dentalium thalloides.
[illegible]		" attenuatum, S. C.; N. C. Va.; = D. dentale.
[illegible]		Ecphora quadricostata, S. C.; N. C.; Va.
[illegible]		Fusus (Neptunea) parilis.
[illegible]	Va.	" " errans (rusticus).
[illegible]		" sulcosus.
[illegible]		" strumosus, Va.
[illegible]	[illegible]. C.; Va.	Fissurella alticosta.
[illegible]	[illegible].; N. C.	" nassula.
[illegible]		" redimicula, S. C.; N. C.; Va.
[illegible]	S. C.	Fulgur rugosus?

Fulgur coronatus.
" canaliculatus, S. C.; N. C.; Va.
" tuberculatus.
" carica, S. C.; N. C.; Va.
" fusiformis.
" alveatus?
Ficus? (Pyrula) sulcosa.
Marginella denticulata.
Melanopsis (Bulliopsis) ovata.
" integra, Va.?
" Marylandica.
Natica interna.
" duplicata, S. C.; N. C.; Va.
" heros, S. C.; N. C.; Va.
" fragilis, N. C.; Va.
Nassa trivittata, S. C.; N. C.; Va.
" obsoleta, S. C.; N. C.
" lunata, S. C.
" quadrata.
" prærupta.
" porcinum, S. C.; Va.
" arata.
Pleurotoma bicatenaria.
" limatula, N. C
" communis, N. C.
" parva.
" rotifera.
Pleurotoma gracilis.
" dissimilis, Va.
Ranelia centrosa, S. C.? N. C.?
— R. caudata?
Scalaria clathra, S. C.; N. C.; Va.
— S. angulata.
" expansa.
Terebra simplex.
" curvilineata.
" loxonema.
Trochus humilis.
" reclusus.
" Bryanii.
Turbo (Monilea) distans.
" " eborea.
Turritella plebeia, Va.
" variabilis, Va.
" laqueata.
" solitaria.
" alticosta, Va.
" octonaria.
Turbinella demissa.
Turbonilla perlaqueata.
Trophon tetricus, Va.
Typhis acuticostata.
Urosalpinx cinerea, S. C.; Va.
Voluta mutabilis, S. C.; N. C.; Va.
" solitaria.

MARYLAND—OLDER GROUP.

Buccinum? protractum.
" lienosum.
Bulla subspissa.
Cancellaria biplicifera.
" engonata.
Crucibulum ramosum, S. C.; N. C.; Va.
" constrictum.
Dentalium thalloides.
Fissurella Marylandica.
Fusus migrans.
" (Neptunea) devexus.
Marginella perexigua.
Niso lineata, Va.
Pleurotoma Marylandica.
" bellacrenata.
" rugata.
Scalaria pachypleura, Va.
Solarium trilineatum.
Sigaretus fragilis.
Trochita (Infundibulum) perarmata.
Turritella indenta, Va.
" exaltata, S. C.
" perlaqueata.
Trochus peralveatus.
Valvula iota.
Voluta mutabilis, S. C.; N. C.; Va.
" solitaria.

Taking each of the two Maryland divisions, already referred to,

[illegible] of the 21 forms occurring also in South [illegible] the deposits of the "newer" group, which [illegible] 8 species; the percentage of forms common [illegible]—25—is thus considerably above that which [illegible] when the State formation was considered as [illegible] increased percentage is determined when [illegible] considered. Of the 26 indicated in the [illegible], 22 belong to the "newer" group, of whose [illegible]ly constitute 28 per cent. The 27 species [illegible]er" group have only 3 (or 10 per cent.) [illegible]arolina, and 5 (or 18 per cent.) common [illegible]mparing the gasteropod faunas of the two [illegible]th each other, we find that there are only [illegible]ange embraces the deposits of both series. [illegible]ta it will be seen that very strong confirma- [illegible]nclusions derived from the examination of [illegible] as to the non-contemporaneity of the South [illegible]North Carolina) deposits with those of Vir- [illegible] and to the existence of two well-marked [illegible] last named State. No conclusive evidence [illegible]elative to the position which the Virginia [illegible]ts hold in respect of each other; for the [illegible] point, as well as for the determination of [illegible]estimony must again be sought in the rela- [illegible]t faunas bear to the fauna of existing seas.

[illegible]ound in the South Carolina deposits:

[illegible]atum = D. dentale.
[illegible]ta.
[illegible] = C. aculeata.
[illegible] = C. unguiformis.
[illegible]atenoides).
[illegible]
[illegible]. plicatella).
[illegible] (L. Carolinensis).
[illegible]tivum.
[illegible]iata.
[illegible] = S. angulata.
[illegible]a.
[illegible]
[illegible]

Dolium galea.
Columbella avara.
Oliva literata (O. Carolinensis).
Ranella (Bursa) caudata.
Cancellaria reticulata (C. Carolinensis).
Fulgur carica.
" perversum (F. adversarium).
" canaliculatum (F. canaliferum).
" pyrum.
Urosalpinx cinerea (Peristernia filicata).
Fasciolaria distans (F. rhomboidea) = F. tulipa.

NOTE.—Three or four additional species, for several reasons here omitted, may, on further examination, be found to be identical with recent forms.

Thus out of a total number of 74 species about 27 are still found living at the present day; the percentage of recent to extinct species—37—is therefore not very different from that which was found to obtain among the acephalous mollusks.

The following recent species may be considered to occur in North Carolina:

Dentalium attenuatum = D. dentale.
Crepidula fornicata.
" spinosa = C. aculeata.
" plana = C. unguiformis.
Natica heros (N. catenoides).
" duplicata.
Natica canrena (N. plicatella).
Scalaria multistriata.
" clathrus = S. angulata.
Obeliscus arenosa.
Trivia pediculus.
Nassa vibex.
" trivittata.
" obsoleta.
Olva literata (O. Carolinensis).
Ranella (Bursa) caudata.
Cancellaria reticulata (C. Carolinensis).
Fulgur carica.
" perversum (F. contrarium).
" canaliculatum.
" pyrum (F. spirata).
Fasciolaria distans = F. tulipa.

All of the above 22 species, which constitute 22 per cent. of the

[illegible] State, are found also in South Carolina. [illegible] in the case of the lamellibranch fauna, a [illegible]ompared with the last mentioned State in [illegible] forms, but yet, as before, the very well [illegible]or identity existing generally between the [illegible]ude the supposition of the representation [illegible] horizons.

[illegible]ryland the number of recent species is [illegible] either South or North Carolina, and the [illegible]o extinct forms is also very materially [illegible]t 141 Virginia species only 12 (or 8½ per [illegible]d as being identical with living forms,

[illegible]tum = D. dentale.
[illegible]ta.
[illegible] = C. aculeata.
[illegible]
[illegible]atenoides).
[illegible]
[illegible]ta.
[illegible] O. literata.
[illegible] S. angulata.
[illegible]
[illegible] (Pyramidella suturalis).
[illegible]a.

[illegible]ent species occurring in the Maryland [illegible] to that from Virginia; but here, owing to [illegible]e fauna, the proportion to extinct forms is [illegible] It is a significant fact that all the recent [illegible] "newer" group, and none to the "older." [illegible]

[illegible]
[illegible]
[illegible]ta.
[illegible]a.
[illegible]atum = D. dentale.
[illegible]
[illegible]
[illegible]
[illegible]atenoides).
[illegible] S. angulata.
[illegible] R. (Bursa) caudata?

The percentage of recent forms is here, therefore, brought up to fourteen, or very nearly that (15), which obtains among the Virginia lamellibranchs, and 4 per cent. below that which was found to characterize the lamellibranch fauna for the same group of deposits.

Summing up the results obtained from the examination of the gasteropod fauna, we find that—

Of about 74 South Carolina species—

52 are found in North Carolina = 70 per cent.
26 are found in Virginia = 35 per cent.
21 are found in Maryland = 29 per cent.
27 are recent = 37 per cent.

Of about 100 North Carolina species—

52 are found in South Carolina = 52 per cent.
31 are found in Virginia = 31 per cent.
18 are found in Maryland = 18 per cent.
22 are recent = 22 per cent.

Of about 141 Virginia species—

26 are found in South Carolina = 19 per cent.
31 are found in North Carolina = 22 per cent.
26 are found in Maryland = 19 per cent.
12 are recent = 8½ per cent.

Of about 105 Maryland species—

21 are found in South Carolina = 20 per cent.
18 are found in North Carolina = 17 per cent.
26 are found in Virginia = 25 per cent.
11 are recent = 11 per cent.

Of about 78 Maryland "Newer" group species—

19 are found in South Carolina = 25 per cent.
17 are found in North Carolina = 22 per cent.
22 are found in Virginia = 28 per cent.
11 are recent = 14 per cent.

Of about 27 Maryland "Older" group species—

3 are found in South Carolina = 10 per cent.
2 are found in North Carolina = 8 per cent.
5 are found in Virginia = 19 per cent.
0 recent.

[illegible] perceived from the preceding summarized [illegible] general results obtained from the examination [illegible] faunas abundantly confirm the conclusions [illegible]y of the acephalous mollusks. Combining [illegible] from the two methods of comparison, we [illegible]

[illegible]h Carolina mollusca—
[illegible]d in North Carolina = 72 per cent.
[illegible] in Virginia = 39 per cent.
[illegible] in Maryland = 31 per cent.
[illegible]cent = 35–38 per cent.

[illegible]h Carolina mollusca—
[illegible]d in South Carolina = 62 per cent.
[illegible]d in Virginia = 38 per cent.
[illegible]d in Maryland = 26 per cent.
[illegible]nt = 26 per cent.

[illegible]inia mollusca—
[illegible]d in South Carolina = 28 per cent.
[illegible]d in North Carolina = 32 per cent.
[illegible]d in Maryland = 27 per cent.
[illegible]nt = 11 per cent.

[illegible]yland mollusca—
[illegible]d in South Carolina = 27 per cent.
[illegible]d in North Carolina = 27 per cent.
[illegible]d in Virginia = 33 per cent.
[illegible]nt = 12 per cent.

[illegible]yland "Newer" group mollusca—
[illegible]d in South Carolina = 36 per cent.
[illegible]d in North Carolina = 34 per cent.
[illegible]d in Virginia = 41 per cent.
[illegible]nt = 16 per cent.

[illegible]land "Older" group mollusca—
[illegible] in South Carolina = 12 per cent.
[illegible] in North Carolina = 15 per cent.
[illegible]d in Virginia = 22 per cent.
[illegible]t = 4 per cent.

[illegible] ved, may be
[illegible] ugh the fore-

[illegible] represent ap-

[illegible] lower (older)
[illegible] rmations just

[illegible] marked faunal
[illegible] ndent of the

[illegible] hat the corre-
[illegible] land deposits
[illegible] and "older"
[illegible] which obtains
[illegible] group (upper
[illegible] might readily
[illegible] nations are ab-
[illegible] s already been
[illegible] bly represent
[illegible] unless such is
[illegible] *appears to be*
[illegible] me is still in-
[illegible] pon.

[illegible] posits of the
[illegible] astly to deter-
[illegible] by geologists,
[illegible] g forms which
[illegible] d and Virginia
[illegible] these last; the
[illegible] the base of the
[illegible] olina deposits,
[illegible] nounce upon.
[illegible] th Carolina is

[...]rding to the original Lyellian classification [...]f the deposits of that State being referred [...] The North Carolina deposits, on the [...]rding to the same system of classification [...]cene period, and yet, as has already been [...]ting between the faunas of the two States [...] to admit of any reasonable doubt as to [...] Nor is the difficulty of determination [...]l is made to European deposits of nearly [...] served to elucidate the principles of the [...] Thus in what might be considered to be [...] for the occurrence of marine pliocene [...]aly and England—the percentages of recent [...] the contained faunas vary within very [...] has shown (*vide* Fuchs, *Die Gliederung* [...] *am Nordabhange der Apenninen von* [...] Sitzb. d. k. Akademie der Wissenschaften, [...]1875) that the so-called pliocene of the [...] may be divided into four faunal horizons, [...] to which are characterized by the following [...]forms:

	Total number of species.	Living.	Percentage of living forms.
[illegible]	141	112	79.4
I[illegible]	332	144	43.3
[illegible]	183	71	38.8
[illegible]	78	24	30.7

[...]fore, correspond very closely in the proportion [...]ith the North and South Carolina deposits. [...] of the sub-Apennine formation, or its equivalent [...]ian geologists referred to the upper miocene, [...] appear more natural, if the percentage of [...]ain the principal basis for the classification [...]ions, to group the doubtful deposits here, [...]he latitude of the miocene, than where they [...]een placed, unless, as would seem from the [...]o (*Les terrains tertiaires de l'Apennin sep*[...] la Société Géologique de France, 2d ser., [...]237, *et seq.*), and Fuchs (*loc. cit.*), strati-

[illegible] roximation.[1] [illegible] ent forms are [illegible].[2] The fol- [illegible] living and [illegible] molluscan [illegible] 878, p. 183,

[illegible]	[illegible]	Percentage of recent forms.
[illegible]	[illegible]	84.1
[illegible]	[illegible]	84
[illegible]	[illegible]	72.2
[illegible]	[illegible]	63.6

[illegible] ms occurring [illegible] ts is, propor- [illegible]—in fact, not [illegible] ound to exist

[illegible] onian) and the [illegible] nations is main- [illegible] versante setten- [illegible] na, ser. iii, vol. [illegible] mio-pliocene [illegible] with the "Sar- [illegible] d consequently [illegible] of both miocene [illegible] horizons—the [illegible] Messinian of [illegible] referred to the [illegible] ication appears [illegible] tology than the

[illegible] *Pliocenici delle* [illegible] r. ii, vol. vii, p. [illegible] una of the Bo- [illegible] e Vienna basin [illegible] ance draws the [illegible] ery close to the [illegible] *iocene,"* . . .).

[illegible] th Carolina deposits. While it may be safe [illegible] sparity existing between the American and [illegible] the formations represented by them are in [illegible] each other, (an equivalency, as has already [illegible] been assumed by Lyell), it may yet be rash [illegible] reason alone that, broadly measured, they [illegible] same period (pliocene) of geological time, [illegible] ince (as will be seen from a comparison of [illegible] an faunal tables) a nearly equal disparity [illegible] faunas of the Crag and some of the sub- [illegible] nsidered to belong to the same period. Nor [illegible] firm conclusively, although the evidence in [illegible] considered to be sufficiently strong, that the [illegible] question are correlative of that portion of [illegible] mation, which, by some geologists, has been [illegible] miocene, or classed as mio-pliocene. While [illegible] lt to determine *absolutely* whether the South [illegible] d, consequently, also the North Carolinian) [illegible] as pliocene or miocene, yet, in view of the [illegible] tertiary beds have been discovered in that [illegible] nywhere else along the Atlantic coast, whose [illegible] pproximates that of the present day, and the [illegible] thus created between them and the succeed- [illegible] which, as determined by Holmes ("Post- [illegible] South Carolina," 1860, Introduc., pp. 3 and [illegible] make up fully 99 per cent. of the molluscan [illegible] ar more natural to group them in the same [illegible] sits of Virginia and Maryland, to which, as [illegible] d by the tables of comparisons, they bear a [illegible] r these reasons the author has preferred to [illegible] ing of miocene age, and as representing the [illegible] f the series.[2] The miocene deposits of the [illegible] according to this determination, be divisible [illegible]

[illegible] tunity as yet of verifying this statement.

[illegible] dence as to stratigraphical position is afforded by [illegible] de between the European and American faunas, [illegible] uivalent, or even representative forms is compara- [illegible] c are about equally divided between the European [illegible] The following South Carolina lamellibranchs may

Upper Atlantic miocene, represented by the South and North Carolina deposits.

Middle Atlantic miocene, represented by the whole, or the greater part of the Virginia deposits, and those of the Maryland "newer" group.

Lower Atlantic miocene, represented by the deposits of the Maryland "older" group, and possibly the lower portion of the Virginia formation.

To these three groups, commencing with the oldest, it is proposed to apply the designations of "Marylandian," "Virginian," and "Carolinian," respectively.

The sequence of the tertiary formations along the Atlantic and Gulf slopes of the United States would, therefore, be approximately as follows:

be considered to occur, or to have their analogues in the crag (pliocene) deposits:

Anomia ephippium.
Ostrea Virginiana, represented by O. edulis.
Lucina filosa — L. borealis.
" crenulata.
Lucina dentata?
Nucula obliqua = Nucula nucleus?
Astarte bella, represented by Astarte gracilis.
" undulata, represented by A. Omalii.
Artemis intermedia, represented by A. lentiformis.
Mactra lateralis, represented by Mactra ovalis.
Solen ensis.
Pandora trilineata — P. inequivalvis?

The following may be said to occur, or to have their analogues in the deposits of the Vienna basin:

Anomia ephippium, represented by A. costata.
Arca plicatura, represented by A. diluvii.
Nucula obliqua = N. nucleus?
Lucina squamosa = L. pecten (reticulata).
" filosa — L. borealis.
" anodonta = L. Miocenica?
" divaricata, represented by L. ornata?
Chama corticosa, represented by C. gryphina.
Cardium magnum, represented by C. Kübeckii.
Artemis intermedia, represented by A. lentiformis.
Pandora trilineata = P. inequivalvis?

[illegible]	[illegible]	[illegible]	[illegible]
MIOCENE.	[illegible] Miocene).	[illegible] in part, of Dana).	[illegible] ogists, and of the faluns of Touraine.
	MARYLANDIAN (Lower Atlantic Miocene).	Deposits of the "Older" group of Maryland, and possibly the lower Miocene beds of Virginia ("Yorktown" epoch, in part, of Dana).	Probably (or at least partially) the equivalent of the "First Mediterranean" of the Austrian geologists, and of the faluns of Léognan and Saucats.
OLIGOCENE.	ORBITOITIC.	Strata characterized by species of *Orbitoides*, etc. Vicksburg beds, Florida beds, etc.	
EOCENE.	JACKSONIAN.	Jackson beds of Mississippi—"White Limestone" of Alabama.	
	CLAIBORNIAN.	Fossiliferous arenaceous deposit of Claiborne, Ala., etc.	Age of the "Calcaire Grosssier" of France (Parisian).
	BUHRSTONE.	Beds below the true Claibornian on the Alabama River. "Chalk Hills" of the southern part of the State, etc. "Siliceous Claiborne" (Hilgard) of Mississippi.	Londonian?
	EO-LIGNITIC.	Lignite, sands, and clays situated at the base of the Tertiary series in Alabama, etc. Eocene beds of Maryland?	Thanetian?

REMARK.—In the above table, in most instances, only the *more prominent* localities for the occurrence of the several deposits have been given, and the absence of reference to certain States, therefore, does not indicate that deposits of a given age are there wanting. The "Jacksonian" beds, which are generally placed at the top of the eocene series, may, on further examination, prove to be oligocene. By some geologists a portion of the post-eocene tertiary deposits of New Jersey, Delaware and Maryland has been referred to the pliocene period, but there does not appear to be as yet sufficient evidence to support such a conclusion. No precise correlation between the entire series of the Atlantic tertiary deposits of the United States and those of Europe can thus far be said to have been determined. There can be no doubt as to the parallelism existing between the Claibornian and the "Calcaire Grossier" (Parisian) of France; but as for the immediately overlying and underlying eocene deposits, their relations can only be approximately fixed from the positions which they occupy in their own series. The "Buhrstone" appears to represent a portion, or perhaps even a greater part of the "Londonian," and the Marlborough and Piscataway beds of Maryland (eo-lignitic?), a horizon probably not far removed from that of the Bracheux sands of the Paris basin, or the Thanet sands of England (Thanetian).[1] The exact equivalents of the "Orbitoitic" have not yet been satisfactorily made out. There can be little or no doubt respecting the position of the "Virginian," whose faunal facies places it at about the horizon of the faluns of Touraine, and the "Second Mediterranean" beds of the Vienna basin; nor can there be much more doubt as to the equivalency, at least in part, of the "Marylandian" and the lower miocene beds of the Vienna basin ("First Mediterranean").[2]

[1] Heilprin, Proc. Acad. Nat. Sciences, 1881, p. 446.

[2] The proportions which the recent species of mollusca bear to the extinct forms is larger in the *older* deposits of the Vienna basin than in the newer; the percentages for the two divisions of the "Mediterranean" are twenty-one for the "First," and fifteen for the "Second" (Fuchs, *Geologische Uebersicht der jüngeren Tertiärbildungen des Wiener Beckens.* Führer zu den Excursionen der D. Geolog. Gesellschaft, Vienna, 1877, p. 103). The following species of Virginia and Maryland lamellibranchiata may be con-

[illegible] Carolinian" have already been fully dis- [illegible]

[illegible] having their analogous in the deposits of the Vienna [illegible]g:

VIENNA BASIN.

[illegible] (bilineata) = S. arctica.
[illegible]ana, represented by P. Menardi.
[illegible] represented by V. scalaris?
[illegible]a, represented by I. cor.
[illegible] represented by C. gryphina.
[illegible] = L. Miocenica?
[illegible] (filosa) = L. borealis.
[illegible]a, represented by L. ornata.
[illegible] (speciosa) = L. pecten (reticulata).
[illegible] = N. nucleus?
[illegible] represented by A. diluvii.
[illegible]va, represented by Mytilus Haidingeri?
[illegible] = P. Soldanii.

CRAG.

[illegible]na, represented by O. edulis.
[illegible]ntracta) = L. borealis.
[illegible] (Conrad) = L. crenulata (Wood)?
[illegible]
[illegible] = N. nucleus?
[illegible]
[illegible]a, represented by A. Omalii.
[illegible]cana, represented by P. Menardi.
[illegible]a = P. gentilis?
[illegible] (trilineata *pars ?*), represented by P. pinna.
[illegible]
[illegible]na, represented by I. cor.

[illegible]hat the age of the beds of this period will be most [illegible]t of the deposits of the lower ("Black") Antwerp [illegible]ed by most Belgian geologists to form the base of [illegible] country (Dewalque, *Prodrome d'une Description* [illegible]*que*, 1880, p. 254), and by Lyell ("Student's [illegible]e "first links of a downward passage from the [illegible]o those of the upper miocene period." The [illegible]t molluscan forms characterizing the fauna of [illegible] determined by Lyell in 1852 ("On the Tertiary [illegible]ench Flanders," Journ. Geol. Soc. London, VIII, [illegible]iderably higher than that which has been shown [illegible]arolinian fauna.

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a fresh-water
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ewberry.
and the occur-
s," by Angelo

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alled attention
animals. He
or the feathers
orated in his
eculiarities of
held by the
mmals as well
ne interesting
e integument.
in the anterior
eeper muscles,
plied by long
lied by much
h of the ulnar
t on the ulnar
s the musculo-
me trunk, and
f these nerves
constant one.
he series, and
ted entirely to

[illegible]les influencing it, and is well developed in [illegible]dian is undeveloped. The muscles of the [illegible]ulnar nerve goes—the Flexor Carpi Ulnaris, [illegible] of the Flexor Profundus Digitorum—are [illegible]esting muscles in the limb. Both muscles [illegible]. They are the most effective muscles in the [illegible]f the manus in swimming and in walking, [illegible] Flexor Carpi Ulnaris, in making tense that [illegible]mbrane of the bat lying between the manus [illegible]dy. The course of some of the cutaneous [illegible] the bat is indicated by raised folds of the [illegible]en present, have systemic significance.

[illegible] was elected a member.

JULY 4.

[illegible] Vice-President, in the chair.

[illegible] present.

[illegible]. L. Sharpless and that of Joseph Swift, [illegible]nced.

[illegible] ordered to be published :—

RIDA, AND THE
TER FAUNA.

rton (" Synop-
es now known
r form of sup-
fossil in any
tes Floridanus
Bay, Florida,
the American
s is there said
us *Assilina*[1] of
the same time
to the internal
oes the figure
ummulite only
ication of these
arefully drawn,
he genus *Orbi-*
of the Eocene
repedia of the
roc. Acad. Nat.
m in question
e Paléontologie,
ophora of Con-
whose relations
imagination of
s of rock frag-
ent parts of the
e Geologist of

lered to have dis-
apart from *Num-*
e Nice, Bulletin

genera, no diag-
been furnished;
to discover any

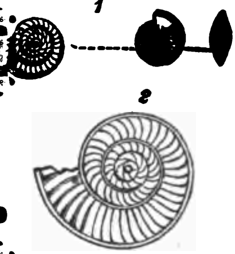
[illegible]ph Willcox, of this city, the writer has [illegible]raminiferal remains that might with any [illegible]be identified with the form above referred [illegible]. While the *Operculina* (*Cristellaria!*) [illegible]ad (*loc. cit.*) to occur with the so-called [illegible]in sufficiently great abundance in some of [illegible]fact, largely entering into the composition [illegible]ses—no trace of anything answerable to [illegible]cted, unless certain associated disciform [illegible]rter of an inch or more in diameter, and [illegible]rnal surface with regular concentric lines [illegible] were actually the objects sought after.[1] [illegible]olutions represented by Conrad could not [illegible]at author make reference in his species to [illegible]tation consisting of granules. On the [illegible]y be safely affirmed that the *Nemophora* [illegible]n with the genus *Nummulites* beyond a [illegible], and the general community of character [illegible]imilar organisms in the one class of the [illegible]istence, therefore, of any fossil North [illegible]-may be considered to have been thus far [illegible]l.

[illegible] may have hitherto existed as to the [illegible]merican Nummulites, none such can any [illegible] an examination of rock specimens that [illegible]by Mr. Willcox from the western shore of [illegible], the writer has been enabled to determine [illegible] existence there of these organisms, but [illegible]) in such quantities as to constitute by [illegible]mmulitic rock. The rock in question is a [illegible] friable limestone, found in the immediate [illegible]heeshowiska River, Hernando County, a [illegible]oast line. The rock whence the fragments [illegible]a level not more than two feet above tide- [illegible] the specimens of Nummulites appear to [illegible]ies, and to the sub-genus *Nummulina*, in [illegible]d from *Assilina*, the individual whorls

[1] [illegible] represent a new form of foraminiferal test, but [illegible]ion precludes the possibility of a satisfactory [illegible]

... the most character-
... *lævigatus*, *N. com-*

1



2

... on of *N. Willcoxi.*[1]
... d by these nummu-
... st sight no question
... s in any formation is
... oligocene age of that
... he remains of these
... ting the supposition
... associated fossils for
... s point. Singularly
... ic rocks—at least in

... tumid (more especially
... specimen about ½ inch
... the arcuate, and some-
... ions about 5, completely
... whorl, and well flexed;

... be found to be identical
... nummulitic deposits of
... rs to differ, yet in the
... te direct comparisons,
... mination of this class of
... se, and to describe it as
... nd Rupert Jones, all the
... belonging to the sub-
... 53, 55 were recognized
... species, which is conse-
... "Introduction to the
... p. 273–4).

... er (miocene or pliocene)

...een placed at my disposal—with very few ...scan remains belong to a period much ...ene, and to species that are still living at ...hat may appear still more singular, they ...l part to land and fresh-water genera— ...pullaria.[1] From this association, and the ...ulites are still met with in existing seas,[2] ...ed that there has been here a co-mingling ...ine and fresh-water organisms, and that ...were laid down under such conditions— ...of a river—where a co-mingling of this ...Indeed, it would be difficult from paleon... ...o disprove such an assumption, were it not ...ible proof to the contrary in addition to ...undance of Nummulites, is afforded in the ...s of *Orbitoides*,[3] a genus which attained ... in the upper eocene ("Nummulitic") and ...which does not appear to have survived ..., therefore, be little or no doubt that the ...by this admixture of an older and newer ... fauna, and comprising both marine and ...anisms, have derived their faunal charac... ...the deposits of a more ancient formation, ...nts, and is the equivalent of a portion of ...ulitic" (whether eocene or oligocene). ...ocalities which these Florida nummulitic ...has not yet been ascertained, but it is fair ...s lie along the Gulf border (possibly in ...where, through the disintegrating action ... fragments have at a comparatively recent ...ether with the material that at the same ... out by the fresh-water streams. The

...ndina parallela, Paludina (Vivipara) Waltonii ...epressa have been identified by Mr. Tryon.

... are referable to the type *N. planulatus* (Car... ...tel, *Handbuch der Paläontologie*, vol. 1, part 1, ...roup (*plicatæ; radiatæ* of Carpenter) to which ...

[3] ...he European *O. ephippium.*

precise position which the formation holds in the nummulitic scale as fixed by Hantken or La Harpe (*Étude sur les Nummulites du Comté de Nice*, Bull. de la Soc. Vaud. des Sc. Nat., vol. XVI., pp. 223–4, 1879), cannot be positively determined from our present data, since exceptionally the group of the *Nummulites plicatæ* is represented as well in the oldest as in the newest of the tertiary deposits marked by the members of this class of organisms.

FIGURES. *Nummulites Willcoxi.*
1, Natural size ; 2, Same, enlarged.

[illegible]SED TERTIARY AMMONITES.

[illegible] J. S. NEWBERRY.

[illegible] Proceedings of the Academy of Natural [illegible]. 94), Prof. Heilprin announces the dis- [illegible] rocks of tertiary age, viz.: the Tejon [illegible]

[illegible]cation of this statement would abrogate [illegible]nt distinctions between the cretaceous [illegible]ld ask Prof. Heilprin to reconsider his [illegible] carefully the accessible facts bearing on [illegible] the succession of living organisms on the [illegible]h, and somewhere there are connecting [illegible]s of all the different geological systems. [illegible] classification is, however, not only a con- [illegible], and that at present in general use has [illegible] an amount of concurrent testimony that [illegible] only be accepted on the most undoubted [illegible] of the age of the Tejon and Chico groups [illegible]ew one. In 1855 Dr. Trask made the [illegible]t volume of the Proceedings of the Cali- [illegible]ces, now repeated by Prof. Heilprin, that [illegible]monites in tertiary rocks. These he con- [illegible] they contained two fossils, pronounced [illegible] with his *Mactra albaria* and *Nucula* [illegible]

[illegible]. Williamson in the Pac. R. Road Rept., [illegible]estion the accuracy of the conclusions of [illegible]gh investigation of the subject afterward [illegible]ek left no doubt whatever that the Chico [illegible]n question—were of cretaceous age, as [illegible]ntain *Ammonites*, *Baculites Inoceramus* [illegible]retaceous fossils. The Tejon group in [illegible]w records the existence of Ammonites [illegible] and forms, according to Mr. Gabb, the [illegible] cretaceous series. But there are many [illegible]ejon and Chico groups, and where one [illegible]low. After years of study on the spot [illegible]greater array of facts than have been

before any other paleontologist, Mr. Gabb was decided in his reference of the Tejon group to the cretaceous system. The material which Mr. Conrad had on which to base an opinion was less abundant, but it was sufficient to satisfy him that his original classification of the rocks in question was erroneous. I would therefore ask in the interest of geological truth, that Prof. Heilprin would give to a question so important as this, very full consideration, and, if possible, make a study of the facts in the field before discarding the conclusions of Prof. Whitney, Mr. Gabb, Mr. Conrad, and Mr. Meek.

...EJON ROCKS OF CALIFORNIA, AND THE OCCUR- ...ITIC REMAINS IN TERTIARY DEPOSITS.

BY ANGELO HEILPRIN.

...ich for a long time was maintained between ...o the age of the Tejon rocks of California, ...r to the eocene series, and by the latter ...t the uppermost member of the cretaceous ...ifornia Report), can scarcely be considered ... question at issue.[1] Both paleontologists ...ined their respective positions to the last, ... no considerations to outweigh the mass of ...time was bearing in both directions.[2] The ...views briefly stated is: That a portion of ...ada de las Uvas, included in the cretaceous, ...retaceous fossil," whereas, on the contrary, ...t least two representative, and at the same ...c tertiary forms—" *Venericardia planicosta* ... and that, where in other deposits referred ... an association between tertiary and creta- ...s, such an association has been brought ... the breaking up of the materials of an older ...nixing up of their contained remains with ...od. By Gabb, on the other hand, it is main- ...he forms referred to as tertiary species are ...hat a repeated admixture between what have ...be strictly tertiary forms and cretaceous ...elf throughout the entire Californian (so- ...ries; and that no such breaking up and ... been claimed by Conrad, are anywhere

...s. of Conchology, I (1865), pp. 362–5; II (1866), ...rn. of Science, new ser. XLIV (1867), pp. 376-7. ... Conchology, II (1866), pp. 87–92; Amer. Journ. ...V (1867), pp. 226-9; Proc. California Acad. Nat. ...301–6.

...ed by one who was intimately acquainted with ...ad finally yielded his position, but he has been ...vidences of such a change of opinion in any of that

The most elaborate defense of Gabb's position is that published in the "Proceedings" of the California Academy of Natural Sciences for 1867 (pp. 301–6), in a paper entitled "On the Subdivisions of the Cretaceous Formation in California." In this paper the author essays to show, by means of comparative tables, the close relation that exists between the faunal characters of the upper and lower members of his cretaceous group (Divisions B and A of the California Report), and to prove by this relationship the fallaciousness of a classification that would relegate the deposits of the group to two distinct eras in geological chronology. The following table of organic remains representing the fauna of the Tejon group (Division B), with the various localities of their occurrence, is there appended:[1]

	Upper Division (B)	Intermediate Beds.	Lower Divisions and Remarks.
Calianassa Stimpsonii,	C.T.		Chico.
Aturia Mathewsonii,	M.C.T.		Martiñez.
Nautilus Texanus,	C.		Shasta Co.
Ammonites, n. s.,	C.M.		Curry's; Benicia; Marti- [ñez.
Typhis antiquus,	M.T.		
Fusus Martinez,	M.T.		
F. Mathewsonii,	M.C.		Curry's.
F. Diaboli,	C.		
F. aratus,	M.		
F. Californicus,	C.T.	LL.	
Hemifusus Hornii,	T.		
H. Cooperii,	C.D.		
H. Remondii,	M.C.T.G.		
? Neptunea supraplicata,	C.D.		
N. gracilis,	M.		
Perissolax brevirostris,		LL.	Many localities.
P. Blakei,	M.C.T.		
Turris Claytonensis,	C.T.		
T. raricostata,	C.		(*Varicostata* by error in [Rep.)
Cordiera microptygma,	T.		
Tritonium Hornii,	C.T.		

[1] A few species occurring in beds said to be intermediate between B and A, but not properly belonging to the Tejon Group, are here included. In addition to the 107 (112, inclusive of those from the "intermediate" beds) species enumerated in the list, a small number of other forms have been described in vol. II (1869) of the "Palæontology" of the California Survey. The different localities in the above table are designated by letters, as follows: M, Martiñez; C, Clayton to Marsh's, T, vicinity of Fort Tejon; G, a locality 10 miles west of Griswold's, near New Idria; I, New Idria; D, San Diego; LL, Lower Lake Village, 1 mile southeast of the town.

	Upper Division (B).	Intermediate Beds.	Lower Divisions and Remarks.
[illegible]	D.		
[illegible]	T.		
[illegible]	T.D.		
[illegible]	M.	LL.	
[illegible]	M.T.G.		
[illegible]	M.		
[illegible]	T.		
[illegible]	M.T.G.C.		
[illegible]	C.D.		
[illegible]	C.	LL.	
[illegible]	T.D.		
[illegible]	T.		
[illegible]	M.		
[illegible]	T.		
[illegible]	T.		
[illegible]	T.		
[illegible]		LL.	Martiñez and elsewhere.
[illegible]	T.		
[illegible]	C. T.(D. ?)		
[illegible]		LL.	Almost everywhere.
[illegible]	T.		
[illegible]	G.I.		
[illegible]	M.T.		
[illegible]	M.C.T.G.D.	LL.	Curry's; S. of Mt. Diablo.
[illegible]	M.T.C.G.D.		
[illegible]sonii	M.		
[illegible]	M. T.		
[illegible]	M.C.		
[illegible]	M.C.T.		
[illegible]	T.		
[illegible]	D.		
[illegible]	M.C.T.D.		
[illegible]	T.		
[illegible]	T.		
[illegible]	M.T.		
[illegible]	C.D.		
[illegible]	M.		
[illegible]	M.C.		
[illegible]	M.C.T.G.		
[illegible]		LL.	M. and Solano Co.
[illegible]	M.		
[illegible]	M.C.T.D.I.	LL.	
[illegible]	T.I.	LL.	
[illegible]	M.T.		
[illegible]	M.D.		Curry's; S.of Mt. Diablo.
[illegible]	M.D.		Curry's; S.of Mt. Diablo.
[illegible]	T.		
[illegible]	M.C.T.D.		M.; Texas Flat and many [other localities.
[illegible]	M.		
[illegible]	G.		Pence's; Texas Flat, etc.
[illegible]	M.C.T.		
[illegible]	D.		
[illegible]	T.		

	Upper Division (B).	Intermediate Beds.	Lower Divisions and Remarks.
C. parilis,	G.M.D.		
Neæra dolabræformis,	M.		
Mactra Ashburnerii,	M.C.T.		Nearly everywhere in [both Divisions.
Gari texta,	M.		
Tellina longa,	M.C.T.		
T. Remondii,	C.T.		
T. Hoffmaniana,	G.		M.; Pence's, and else- [where.
T. Hornii,	T.		
T. Californica,	C.T.		
Meretrix Uvasana,	M.C.T.I.G.		
M. Hornii,	T. [D.		
M. ovalis,	T.		
Dosinia elevata,	T.		
D. gyrata,	M.C.T.G.		
Tapes Conradiana,	G.M.T.	LL.	
T. quadrata,	M.T.		
Cardium Cooperii,	M.T.D.		
C. Brewerii,	M.C.T.G.		
Cardita Hornii,	M.C.T.I.G.		
Lucina cumulata,	T.		
L. cretacea,	C.		
Mysia polita,	M.C.I.		
Crassatella grandis,	M.T.	LL.	
C. Uvasana,	T.		
Mytilus ascia,	T.		
Modiola ornata,	M.C.T.I.		
Septifer dichotomus,	T.		
Crenella concentrica,	M.		
Avicula pellucida,	M.G.	LL.	S. Louis Gonzaga.
Arca Hornii,	T.		
Cucullæa Mathewsonii,	C.	LL.	M.
Barbatia Morsei,	D.		
Axinæa sagittata,	M.T.G.		
A. Veatchii,		LL.	M.; Tuscan Springs, etc.
Nucula (Acila) truncata,	M.T.		Everywhere.
Leda protexta,	M.C.T.G.		M.
Placunanomia inornata,	D.		
Flabellum Remondianum,	C.		

Of the total number of 112 species here enumerated, 105 are recorded as being found in Division B (Tejon group), 15 in the so-called "intermediate beds," and 21 in various deposits of the lower group (Division A). The number of forms held in common by Divisions A and B, as is shown by the above table, and the intimate faunal relations which the "intermediate beds" hold to the deposits supposed to lie above and below them, it is claimed demonstrate conclusively that the series is a continuous one, and admits of no such separation as had been insisted upon by Conrad.

The value of a comparative table, such as is here presented,

[illegible] the accuracy of its details; whether in [illegible]is accuracy is such as to entitle the table [illegible], remains to be seen. On page 302 of the [illegible]r. Gabb states: "Of 280 species of fossils [illegible] in the Californian cretaceous rocks, 107 [illegible] member. Of these, 84 are peculiar, *and* [illegible]*n between undoubted members of this group* [illegible]*s of the older group.*" The inaccuracy of [illegible]e readily manifest when an appeal is made [illegible] the preceding table.[1] It will be seen that [illegible] enumerated whose range comprises the [illegible] of both the older and newer groups (A [illegible]

[illegible] Cylichna costata,
[illegible] Martesia clausa,
[illegible] Mactra Ashburnerii,
[illegible] Tellina Hoffmanniana,
[illegible] Avicula pellucida,
[illegible] Cucullæa Mathewsonii,
[illegible] Nucula (Acila) truncata,
[illegible] Leda protexta.

[illegible]r the original descriptions of the species [illegible] vol. I of the Palæontological Report, and [illegible]distribution published in vol. II, we find—
[illegible] all the specimens (4) of *Nautilus Texanus* [illegible]vision A (older group), no reference being [illegible]rrence in any deposit of newer date; nor is [illegible]cies being found in Division B made in the [illegible]stribution (p. 209) contained in vol. II of [illegible] In vol. II of the "American Journal of [illegible]he species is quoted from Clayton (B), but [illegible]idently confounded the name of a finder [illegible]y Mr. Clayton") with that of the locality.

[illegible]lently included the "intermediate beds" among [illegible] of the older group," and yet to disclaim any [illegible] so doing, he adds (immediately following the [illegible]Besides this, I was fortunate enough to discover [illegible], this fall, where, within a space of two feet, I [illegible]per and lower forms, proving the existence of a [illegible]aps, group of beds." In justice to Mr. Gabb, it [illegible]. 305 of the same paper, only 16 species, a figure [illegible]e, are stated to be common to Divisions A and B.

2. Vol. I, p. 195, no indication is given of the occurrence of *Cucullæa Mathewsonii* in deposits belonging to Division B, although the locality Martiñez, where beds representing both B and A are to be met with, is given. From this indefinite statement it might be inferred that the specimens were obtained from the upper beds, but any doubt on this point is set at rest by the subsequent reference (Amer. Journ. Conchol. II, p. 88; Cal. Pal. Rept., II, p. 249) of these Martiñez beds to the Martiñez group (A). The second locality given (for a single specimen) is "Clayton, *below*[1] the coal-veins," which in vol. II of the Report (*loc. cit.*) is referred to the "intermediate beds."

So that deducting these two forms which have not yet been detected in the deposits of Division B, these last have at the utmost (at least as far as is known), only 14 species common to the lower Division (A), instead of 23 as claimed.

But while 14 species *may* actually be held in common by the upper and lower members, we are far from satisfied that such really *is* the case. Thus Mr. Gabb states (Pal. Report, I, p. 153) that *Mactra Ashburnerii* "is one of the most common fossils in the State," and instances numerous localities of its occurrence in both divisions A and B; and further (in Am. J. Conchol., II, p. 88), that it is found in "almost every locality of both Divisions." It would certainly be a difficult matter to disprove such an affirmation, but it is, to say the least, surprising, that a careful examination of all the specimens of the Gabb collection in the possession of the Academy of Natural Sciences, which have served as the basis of the Palæontological Report, and which comprise probably the greater number, if not nearly all, of the cretaceous "types" and figured specimens, we have failed to discover a single fragment from Division A (Martiñez, Chico, and Shasta groups) that could with any amount of positiveness, or with anything more than considerable doubt, be referred to the form that under the same name is credited to Division B (Tejon group). This is the more singular since the collection embraces a very considerable number of rock fragments, which are crowded with molluscan remains. Two specimens marked in Gabb's handwriting as coming from Texas Flat (Chico group, A), and considered by that paleontologist to represent the "typical form"

[1] The italics appearing in the quotations belong to the writer of this article.

...ies, differ very essentially in outline from ... and are doubtless specifically distinct. ... *Nucula truncata* Mr. Gabb instances (Pal. ... localities of its occurrence in Division A, ... locality of Division B, but no mention is ... as a locality of the first Division. On the ... *tiñez specimens of this species in the Gabb ... as belonging to Division A!* In vol. II ... rts, however, we are informed that this ... most every locality of the Chico, Martiñez, ... ut we must confess that, after a diligent ... to discover among the Tejon rock frag... uld with sufficient evidence be referred to ... ve been able to find the faintest traces of ... of Gabb) (or for that matter, of several ... to group B) in the rock fragments obtained ... rs, but it would perhaps be premature to ... it may not really occur there. On page ... locality given for Division A is (near) Mar... ne a locality for Division B), but in the ... ppended to the same volume (p. 235) the ... zaga is substituted instead. *Tellina Hoff-...* in the original description (vol. I, p. 156) ... ality of Division B, nor is it included in the ... cies given in 1866 in the American Journal ... 88). In vol. II of the Reports, however ... which could originally "always be dis... ight or slightly convex cardinal margins," ... ome a "rather variable" form, is reported ... Martiñez and "Griswold's") of the Tejon ... of Mr. Gabb's figures (I, pl. 22, figs. 33, ... will, we believe, fail to convince one that ... same species is represented, and, indeed, in ... cimens the "straight or slightly convex ... racteristic of the species have become both ... rly *decidedly* convex.

... he assistance of his "intermediate beds," ... time of the publication of the first volume ... e the intimate relation that exists between ... members of his cretaceous series. An ex-

amination of the preceding table will show that 7 species, not found in deposits older than the intermediate beds, are credited as being common to these last and the Tejon group, as follows :—

Fusus Californicus,	Spirocrypta pileum,
Buccinum liratum,	Tapes Conradiana,
Fasciolaria læviuscula,	Crassatella grandis.
Galerus excentricus,	

These are said to be associated with a limited number of forms that are found in the lower division, but which do not pass above, and (if we except *Cucullæa Mathewsonii*, which has been shown *not* to belong to the upper member) with only one *solitary* form, *Avicula pellucida*, that is common to both divisions, a circumstance of suspicious import. But in turning to the original description of *Fasciolaria læviuscula* (vol. I, p. 101) we find no mention of its being found in deposits belonging to Division B, but on the contrary, it is distinctly stated to have been "found in the strata immediately *below* the coal in the Mount Diablo district" (although it was *associated* with several species found also at San Diego and Martiñez of Division B), and in vol. II of the Report (p. 220), *only* the "beds intermediate between the Martinez and Tejon groups" are given as the locality of its occurrence. Nor do we find in the lists of distribution contained in vol. II[1] any mention of the "intermediate beds" in the case either of *Buccinum* (*Brachysphingus*) *liratum*, *Galerus excentricus*, or *Spirocrypta pileum*, although it does occur in the case of the remaining three (*Fusus Californicus*, *Tapes Conradiana*, and *Crassatella grandis*).

We believe it may be fairly questioned, from what has already been shown, whether Mr. Gabb's tables afford *at all* a safe criterion upon which to base the solution of the problem at issue. The numerous discrepancies would seem to prove almost conclusively that in their preparation the author was in a measure, or even to considerable part, borrowing from his memory, or, at any rate, not absolutely from the data that were presented in the field. But granting that the tables be entirely trustworthy in the statements that have been called into account, do they at all prove his case?

[1] Published more than one year *after* the paper in the "Proceedings of the California Academy, and therefore at a time when Mr. Gabb ought to have been fully cognizant of the value and position of his intermediate beds.

[illegible]edly not. Surely a geologist would find it [illegible]ption of immediate continuity and without [illegible]change in the general character (whether [illegible]rrestrial) of the fauna, to account for the [illegible]umstance, that, in a locality rich in organic [illegible]mber of a closely connected series should [illegible]una about 80 per cent.[1] of whose individual [illegible]elf. In order to antagonize this difficulty, [illegible], to show still more effectively how much [illegible]bers of this upper group of deposits are [illegible]low them (and, consequently, how indis-[illegible]an to those following (and, therefore, how [illegible]bb submits the argument (Proc. Cal. Acad. [illegible] 306; A. J. Science, new ser., vol. XLIV, [illegible]e species are peculiar to this group (B), or [illegible][2] rocks; *not one* has been found associated [illegible]ms, or with species known to occur in the [illegible]f California. Five of the genera are pecu-[illegible] An Ammonite ranges entirely through the [illegible]e highest fossiliferous strata. The genera [illegible] *Margaritella*, and the sub-genus *Anchura*, [illegible]s, are all recognized as strictly characteristic [illegible]o much so, that the presence of a single [illegible]tive of either of these genera would be [illegible]vidence of the cretaceous age of any rocks [illegible]found." But Mr. Gabb omits to emphasize [illegible]lthough a casual reference to a part of the [illegible]directly bearing upon the subject of chrono-[illegible]he *first* appearance (in California) in the [illegible]p of the genera (among others) *Ancillaria*, [illegible]*œa*, *Crepidula* (*Spirocrypta*), *Cassidaria* [illegible]*us*, *Mitra*, *Nassa*, *Niso*, *Olivella* (*or Oliva*), [illegible]*Triton*, *Trochita*, *and Typhis*, many of them [illegible]has been generally recognized *exclusively* [illegible]does that paleontologist appear to lay the [illegible]even advert to the circumstance that the [illegible]enera *Ancyloceras*, *Hamites*, *Helicoceras*,

[1] [illegible] into account the full number of forms said to be [illegible]pper member and the intermediate beds.

[2] [illegible]s.

Turrilites, *Crioceras*, ? *Ptychoceras* (*Helicancylus*), *Baculites*, *Inoceramus*, *Trigonia*, *Gryphæa*, and *Exogyra*, which are found in one or other, or several of the deposits of the older group (A), are here completely wanting. Surely the wholesale appearance and disappearance of characteristic genera have *at least* as much import in the determination of geological chronology, or in the fixing of systemic relationships, as the casual persistence of a few specific types, and, indeed, a paleontologist or zoologist would be very bold to assert that the distinctive characters of a fauna depend rather upon the features drawn from its specific, than from its generic constituents.[1] It would appear strange, to say the least, if a geologist were now to unite the Devonian and carboniferous formations, or the Silurian and Devonian, for no other reason than that they comprise in their several faunas a number of "common" forms, when the general facies of these faunas is very distinct.[2]

[1] Accepting the generic determinations of Mr. Gabb, we find that of about 77 genera credited as belonging to the Tejon group, no less than 33 (or 43 per cent.) have *not* been described from the cretaceous deposits underlying this group; and 3 additional ones do not pass beyond the "intermediate beds!" The faunas are here, then, decidedly *very* distinct, despite the fact that a limited number of "common" or passage forms (forming at the utmost only about 13 per cent. of the Tejon fauna) may be said to exist.

[2] According to Etheridge (Anniversary Address, London Geol. Soc., 1881—Quart. Journ. Geol. Soc., pp. 184–185), of 37 species of brachiopods occurring in the upper British Devonian, 16 pass into the succeeding carboniferous deposits; these last also hold 5 species of upper Devonian lamellibranchs, 5 gasteropods, 2 heteropods, and 4 species of the genus *Orthoceras*. Of the total number of 183 genera and 526 species constituting the British Devonian fauna, 30 genera and 49 species pass into the carboniferous (*loc. cit.*, p. 197). In California, of about 141 genera described from Division A (Martiñez, Chico, and Shasta groups), 44 are also found in Division B (Tejon group), and, therefore, the proportion of generic forms common to what is here claimed to be both cretaceous and tertiary is greater than that which obtains in the case of the British Devonian and carboniferous formations. But if in both instances only the molluscan fauna (which comprises, with the exception of 5 species, all of Gabb's described forms) is taken into account, a very striking correspondence in the numerical proportions presents itself. Thus, according to Etheridge's tables, 25 out of the 74 Devonian molluscan genera appear in the carboniferous deposits, or nearly 34 per cent.; in California, 40 of the 133 Division A genera are also represented in Division B, or 30 per cent. According to

[illegible] ained, that in addition to a purely specific [illegible] he established through generic ties. "An [illegible] irely through the group to the top of the [illegible] strata. The genera *Perissolax*, *Gyrodes*, [illegible] sub-genus *Anchura*, of the genus *Aporrhais*, [illegible] rictly characteristic of the cretaceous; so [illegible] sence of a single undoubted representative [illegible] era would be strong presumptive evidence [illegible] of any rocks in which it might be found" [illegible] 306). Laying aside for the present the [illegible] nite, only a few words need be said respect- [illegible] As Mr. Conrad has already shown (A. [illegible] xliv, p. 376), no locality in Division B is [illegible] ecies of *Gyrodes* in vol. i, of the report, but [illegible] are clearly assigned to the Division A; and

[illegible] p. 179), 12 genera (of 137), and 20 species (of 392), [illegible] n) fossils pass into the Devonian; and 11 genera [illegible] (of 182) from the Cambrian into the Silurian [illegible] circumstance that the faunal break between the [illegible] periods is in all, or nearly all, localities thus far [illegible] tween the Devonian and carboniferous or the [illegible] has no bearing on the point at issue, since a con- [illegible] exist somewhere, and it is quite immaterial where [illegible] d. The assertion that has at various times been [illegible] ous species have been known to pass beyond the [illegible] as been definitely refuted by comparisons made [illegible] al faunas of chalk and the Atlantic ooze, and, [illegible] mination will reveal a number of higher forms in [illegible] undistinguishable from forms which have up till [illegible] haracterize strata of more ancient date. It would [illegible] leontologists to determine by what special charac- [illegible] (*Nautilus*) or brachiopods of tertiary, or for that [illegible] e distinguished from their more ancient congeners, [illegible] high authority as Mr. Davidson ("British Tertiary [illegible] aeont. Soc. Repts., 1852), has found it difficult to [illegible] expressed by Edward Forbes that at least one [illegible] *rebratulina caput serpentis*) is also a cretaceous [illegible]

[illegible] it is not *absolutely* stated that these several genera [illegible] f the Tejon group (but "in this and associated [illegible] in which the statement is made would seem to [illegible] ccur; and Mr. Gabb's inference would certainly [illegible] tion of the statement.

in vol. ii (p. 222) the transition beds are given as the upper limit of the genus. In the case of the genus (or sub-genus) *Anchura*, the species especially referred to, *A.* (*Aporrhais*) *angulata*, is stated (vol. i, p. 128) to occur very sparingly near Martiñez "in a single stratum of greenish-gray limestone," and is credited *exclusively* to Division B; yet, in the same description, a locality in Division A—Cottonwood Creek, Shasta County—is mentioned! Furthermore, in the "tabular statement" appended to the same volume (p. 227), the Martiñez locality of the identical species is referred to Division A! In vol. ii (p. 226), while the localities are given, the group has been wisely omitted. As to the forms that have been referred to *Perissolax*, it would be very difficult to state why they should be considered as being characteristically cretaceous. It is true that the genus was founded on cretaceous species,[1] but it would be, indeed, a very comprehensive genus that would embrace such entirely dissimilar forms as the *Pyrula* (*Fusus*) *longirostra* of D'Orbigny,[2] one of the types of the genus, and the *P. Blakei* (*Busycon? Blakei* of Conrad) and *P. brevirostris* that are here referred to it (and also the *Fusus Durvillei* and *F. Hombroniana!*).[3] There is, as far as we are aware, not the faintest reason for considering the California species here indicated as representing cretaceous molluscan types, whatever may be thought of the genus *Perissolax* as originally founded; on the contrary, as Conrad has pointed out (A. J. Science, new ser., xliv, p. 376), they more properly belong to his genus *Levifusus* (subgenus? of *Fusus*), represented in the eocene of Alabama by the *Fusus trabeatus* (*F. bicarinatus* of Lea, young).

Respecting the forms that have been referred to *Margaritella*, and to their being "strictly characteristic of the cretaceous," it need only be stated that Mr. Meek, the author of the aforesaid

[1] Gabb, Proc. Am. Philos. Soc., 1861, p. 66.

[2] *Paléont. de l'Amér. mér.*, p. 119, pl. 12, fig. 13.

[3] D'Orbigny, *Voyage de l'Astrolabe et de la Zélée*, pl. 2, fig. 1, and pl. 1, fig. 31. . . . Gabb, Proc. Amer. Philos. Soc., 1861, p. 67. It can scarcely be wondered at that neither Conrad nor Stoliczka could grasp the characters of the genus, and that the latter referred the typical form not only to a distinct genus, but to a very different family, the *Purpuridæ* (Palæontologia Indica, Cretaceous Fauna, II, p. 149).

... *not* belong where they have
...*riella* of Wood, which was
...l, *S.* (*Margarita?*) *maculata*

...'s characteristic cretaceous
...ammonite, of which several
...d in the rocks of the Tejon
...enus of the *Ammonitidæ*,[3] the
...nough to discover a solitary
... that has been drawn from

...ctorily shown the erroneous-
...at have served as a guide in
...estion, and to their reference
...mains to examine in greater
... be considered as *not* creta-
... what has already been said,
...red solely with respect to the
...out (and *probably considerably*
...uliar to itself, or at least that
...ing a lower horizon; that 33
... per cent. of the entire num-
...the older deposits; that with
...specimens (about 7 in all) of
...here is a complete absence of
...s (while they are sufficiently
... finally, that there is a sudden
...most of which are but barely,
...us deposits of the world (as
...nd several of which are not
...y period. The appearance
...a *Ancillaria*, *Bulla*, *Conus*,
...*icus*, *Gadus*, *Mitra*, *Nassa*,
...a, *Rimella*, *Triton*, *Trochita*,

... ix, Invertebrate Palæontology,

...Mag. Nat. Hist., ix, 1842, p. 531;
...Rep., 1848), i, p. 134.

... admit of positive generic deter-

and *Typhis*[1] has already been adverted to. But these are not the

[1] The writer is unaware that any unequivocal species of the genera *Ficus* (*Sycotypus*; *Pyrula*, as restricted), *Gadus*, *Nassa*, *Niso*, *Olivella* (or *Oliva*), *Rimella*, or *Typhis*, have been described from deposits antedating the tertiary.

Pyrula Pondicherriensis of Forbes (Trans. Lond. Geol. Soc., vii, p. 127, 1846; *Pyrula Carolina* of D'Orbigny, Voy. Astrolabe et Zélée, Pal. pl. 11, figs. 34 and 35), a ficuliform species from the cretaceous deposits of India, has been shown by Stoliczka to belong to the *Volutidæ*, and to a new genus, *Ficulopsis* (Pal. Indica, Cretac. Fauna, ii, pp. 84–5).

Nassa lineata of Sowerby (Fitton's Report, Trans. Lond. Geol. Soc., 2d ser., iv, p. 344, pl. xviii, p. 25), from the Blackdown sands, may be a true member of the genus to which it is referred, but neither the figure nor description of the species permits of such a determination. The second species described in the same report, *N. costellata*, has been referred by D'Orbigny, Pictet, and Stoliczka to *Cerithium*. The first of these is the only cretaceous species recognized by Pictet and Campiche (*Materiaux p. l. Paléont. Suisse*, iii ser., p. 673) as being probably a *Nassa*, but the author's conclusions on this point appear to have been based entirely upon Sowerby's original determination. Stoliczka (*op. cit.*, p. 143) places *Buccinum Steiningeri* of Müller (*Petr. Aach. Kreidef.*, p. 78, 1851), an unfigured species from the chalk of Aix-la-Chapelle, in *Nassa*, but on what authority or for what reasons, this reference is made, we have found it impossible to discover. The two species of *Nassa* described by the last named author from the cretaceous Arrialoor group of India, *N. Vylapaudensis* and *N. Arrialoorensis*, and determined from imperfect specimens, are at best but very doubtful, and, indeed, it is stated that the last may possibly be a *Mangelia* or *Defrancia* (*op. cit.*, p. 145)!

Niso Nerea of Deslongchamps (*Bull. Soc. Linn. Norm.*, 1860, v. p. 126; *Turbo Nerea* of D'Orbigny, *Pal. Franc. Terr. Jur.*, pl. CCCXXVI, figs. 4 and 5) considered by Stoliczka (op. cit., p. 288) to be possibly referable to one of the subgenera of *Niso*, does not appear to have much, if anything, in common with that genus; nor can much more be said in favor of the other species (*Turbo*, *Trochus*, etc.) referred by Deslongchamps to the same genus.

Oliva vetusta of Forbes (Trans. Lond. Geol. Soc., 2d ser., VII, p. 134, pl. 12, fig. 23), from the cretaceous rocks of Southern India, is a *Dipsacus* according to Stoliczka (Pal. Indica, Cret. Fauna, II, p. 452, pl. XXVIII, fig. 27). The *Oliva? prisca* of Binkhorst (*Monogr. Gastr. et Ceph. Craie sup. de Limbourg*, 1861, p. 71, pl. Va², fig. 14) is unrecognizable as a member of the genus to which it is referred, and, according to the author himself, may possibly be a fragment of a *Cypræa*.

Of the genera *Pseudoliva* and *Ancillaria* it would appear that only a single cretaceous species of each has thus far been recognized; the *P. subcostata* of Stoliczka (*op. cit.*, p. 145) (from the Arrialoor group of Southern India), described from a solitary imperfect specimen, and the *A.*

enera that are here repre-
tum (Palæont. Calif., I, p.
we have a true *Cancel-*
[1]) *striata* (I, p. 144) is a
a very limited number of
have appeared before the
p. 109) appears more like
ns examined, all of which
being considerably more
But to whichever of these
immaterial in the present
mber of either form, as far
ribed from any formation
of the Report (p. 157) we
Bullia (sub-genus *Molopo-*

Kreidef., p. 79, pl. 6, fig. 23),
cribed from a single imperfect
eral doubtful cretaceous forms
is probably the *C. Marticensis*
les, Bouches-du-Rhone, 1842, p.
Martigues. There seems to be
mperfect specimen here figured
eans surprising if closer exami-
losely related to *Acteonella* or
n (*Mém. Soc. Geól. de France*,
chalk of Tours, is not unlikely,
be a member of the cretaceous
g from all other true cones) in
rad (Journ. Phila. Acad. Nat.
, from the "Ripley" group of
eneric determination. *Conus*
etac. group, 1834, p. 49, pl. X,
Carolina, is an eocene species.

sed new genus, as pointed out

Nordd. Kreidegeb., 1841, p. 83,
of Quedlinburg and Dülmen,
ssibly prove to be a *Sigaretus*,
to render this point rather sus-
(*Mém. de la Soc. d'émul. du*
5, 1856) is a *Natica* according
e, 3me sér., p. 380, pl. LXXVI,

phorus, doubtfully different from the tertiary and recent genus, or sub-genus, *Buccinanops*); and finally (*Ibid.*, p. 162), a *Terebra* (*T. Californica*), a genus whose range has not yet positively been determined to extend back beyond the limits of the Tertiary period.

So that of the 77 genera represented in the Tejon group, at the very least 22 are more or less distinctively[1] tertiary; and of these 22, 11 are not positively known to have appeared before that epoch of geological time. On the other hand, if we except the six or seven fragments of *Ammonitidæ* (one, or possibly two genera) already referred to, there would seem to be in the entire number *not a single distinctively cretaceous generic type!*

Evidence Afforded by Specific Forms.

The circumstance, considering the deposits here referred to to be eocene, that "not one [species] has been found associated either with living forms, or with species known to occur in the recognized tertiaries [miocene and pliocene] of California" (Gabb, Proc. Calif. Acad. Nat. Sciences, 1867, p. 306), is not very surprising. The number of species that pass from the deposits of eocene age into the miocene is frequently very limited, or there may not be a single one. This last is, singularly enough, what obtains in the case of the tertiaries of the eastern and southern United Stated, where both the eocene and miocene formations are extensively developed, and where the organic remains are also very abundant.[2]

Leaving aside the question of identity as existing between the eocene and miocene forms, it will be important to ascertain what correspondence, if any, manifests itself between the specific types of the deposits here discussed, and those of other tertiary (eocene) localities; for the determination of this point we subjoin the following notes on a few of the species:

Cardita Hornii and Cardita planicosta.—Whether the species of *Cardita* described by Conrad from the rock of Cañada de las Uvas as *C. planicosta* (Pacific R. R. Reports, V, p. 321), and designated by him as the "finger post of the eocene" (*Ibid.*, p. 318), is the veritable *C. planicosta* of Lamarck, or not, it is impossible to state. The author's intimate acquaintance with that species, from both European and American

[1] But sparsely, if at all, indicated in the earlier deposits.

[2] It would be, perhaps, going too far to state, that not a single species is held in common by these eocene and miocene deposits; it would be more proper to say, that none such has yet been recognized.

[illegible] presence of fairly preserved speci- [illegible] the specimens in question were [illegible] determination, can, at the present [illegible] well with the species (and in a [illegible] to admit of a positive conclusion [illegible] uld be impossible to affirm conclu- [illegible] *ii* of Gabb (Palæont. Calif., I, p. [illegible] ar the same locality. I believe [illegible] ut by Gabb (II, p. 188), as distin- [illegible] the form of the ribs, which are [illegible] other (*C. planicosta*)—has a cer- [illegible] c distinctions being based upon it [illegible] etermined when a greater number [illegible] her for comparison. In all other [illegible] will be seen from the following [illegible] ens with shells from the London [illegible], except in the extreme quadrate [illegible] ters save one. The hinges are so [illegible] written description of their minute [illegible] an artist with their delineation." [illegible] d by the aforesaid paleontologist, [illegible] ary,[2] since what may be considered [illegible] iter, completely wanting (although [illegible] deposits.

[illegible] stated by Conrad, to be a *Dosini-* [illegible] espite the assurances of Mr. Gabb [illegible] determined from the figured speci- [illegible] *iniopsis Meekii* of Conrad (*Cytherea* [illegible] of Maryland and Virginia, from [illegible] width of the flattened area on the

[illegible], a form allied to, but not as pro- [illegible] the Paris basins.

[illegible] pl. 18, fig. 36), a form very closely [illegible] of Conrad (= *P. nexilis* and *P.* [illegible] orne, Ala. The occasional tricari- [illegible] ropean representative, is here also [illegible] e could detect between the two [illegible] reticulation is somewhat the finer, [illegible] der of this reticulation, it may be [illegible] than varietal value.

[illegible] four and a half inches across, [illegible] *nicosta*" (II, p. 188).

[illegible] weathering, is very much as in

[illegible] he specimens of the Gabb col

Tritonium paucivaricatum (I, p. 95, pl. 28, figs. 209, 209a, unrecognizably figured), as has already been stated, is a *Cancellaria*, and a form so closely related to the *C. evulsa*[1] of Brander ("Fossilia Hantoniensia," 1766, p. 14, as *Buccinum*; pl. 1, fig. 14), from the British Bartonian (upper eocene), that it may well be doubted whether it is at all specifically distinct; and the same may be said of its relation to a form[2] from the lower eocene deposits of Clarke County, Ala., which is doubtfully referable to the *C. tortiplica* of Conrad.

Megistostoma striata (I, p. 144, pl. 21, figs. 108a, b).—While, perhaps, from the slightly imperfect condition of the specimen, it would be impossible to affirm positively that this species is identical with the *Bullæa expansa* of Dixon, from the eocene of Brackelsham, England, and the Paris basin (Deshayes, *Animaux sans Vertebres, Bassin de Paris*, II, p. 652, pl. 36, figs. 27–30, *Mollusques Cephales*), yet, what there is of it shows absolutely no character by which to distinguish it from that species.

CONCLUSION.

We believe it has been satisfactorily shown from what has preceded, that the rocks of the Tejon group (cretaceous Div. B. of the California survey), despite their comprising in their contained faunas a limited number of forms[3] from the subjacent

[1] Compared with actual specimens.

[2] Kindly transmitted for examination, with other fossils, by Dr. Eugene A. Smith, State Geologist of Alabama.

[3] The reliance that is to be placed upon Gabb's *positive* assertions as to the localities or horizons whence certain species have been obtained, may be inferred from the statement (Am. Journ. Conchology, 1866, II, p. 90), that *Naticina obliqua* and *Turritella Uvasana*, species claimed to be eocene by Conrad, were "found by Mr. Rémond and myself in strata containing *Ammonites* and *Baculites*, and abounding in other cretaceous forms." A reference to the descriptions of these two species, as well as to the various tables of distribution published (before and after the making of the statement) by Gabb, clearly shows that the forms in question were *not* known to that paleontologist to pass beyond the limits of Division B. How then could they be associated with the *Baculites*, when the only Californian species of that genus, *B. Chicoensis*, is distinctly stated (I, p. 81) to be "only found in Div. A"? So likewise from the statement (Am. Journ. Conchology, II, p. 89), that *? Ammonites Cooperii*," one of the *Ammonitidæ*, whether an *Ammonite* or not, is from the presumed eocene of Mr. Conrad, from San Diego, and the family is sufficient to establish the age of that deposit, had we no other proof." But singularly enough, in the description of this ammonitic fragment (I, p. 70), the specimen is said to be "of particular interest from the fact that it is *one of the oldest* fossils found in the southern part of the State, being *considerably below* the newer cretaceous fossils of San Diego!" (The italics belong to the writer of this article). And in vol. II (p. 212) the species is doubtfully referred to the Chico group!

[illegible] ubted representatives of the [illegible] age, and for the following

[illegible] 0, or possibly considerable [illegible] iar to the group, or, at least [illegible]

[illegible] forms (33 out of 77) that [illegible] or older strata;

[illegible] less distinctively tertiary [illegible] *Megistostoma*), *Bullia* (s. g. [illegible] *ssidaria*, *Cancellaria*, *Cyp-* [illegible], *Nassa*, *Niso*, *Olivella* (or [illegible] *us* (or *Naticina*), *Terebra*, [illegible]

[illegible] exception of about a half-a- [illegible] *mmonitidæ*) of distinctively [illegible]

[illegible] ogy existing between several [illegible] esentatives from other well [illegible].[1]

[1] [illegible] aintained by Prof. Jules Marcou [illegible] ngton, 1876, p. 387), who made [illegible] I was not able to find a single [illegible] ous generic forms, in the entire [illegible] nion expressed by Mr. Conrad, [illegible] 5, of Pacific Railroad Explora- [illegible] from certain fossils found in an [illegible] ada de las Uvas, has very judi- [illegible] tertiary formation" . . . . [illegible] uch of the fauna of the sands of [illegible] sands of Gre[*i*, ?]gnon, near

JULY 11, 1882.

Mr. THOS. MEEHAN, Vice-President, in the chair.

Thirteen persons present.

A paper was received for publication, through the Botanical Section of the Academy, entitled "On Rhus cotinoides," by Dr. Chas. Mohr.

JULY 18, 1882.

Mr. THOS. MEEHAN, Vice-President, in the chair.

Nine persons present.

Nest of Chætura pelasgia.—Mr. THOMAS MEEHAN exhibited a nest of the chimney-swallow, or swift, from a chimney in Germantown. It was made of small twigs of the cherry-tree, and fastened together, and to the wall of the chimney by vegetable gum of some kind, indeed, pure gum, undistinguishable in taste and general appearance from the kind which exudes from cherry-trees. He referred to the statement of Audubon, and which has apparently been copied without further question by subsequent authors, that the gum used by the bird in the building of its nest is a salivaceous secretion of its own, and that there are within the mouth of the bird, special organs provided for this secretion. Only for this positive statement of Audubon there would be no question, he thought, that this was cherry-gum, obtained at the same time and place from where the twigs were obtained, namely, the cherry-tree. It was not easy to tell one kind of gum from another in the absence of chemical analysis, but he believed there was no difficulty in distinguishing animal gum from the gum yielded by vegetables. It was inconceivable that an animal should secrete vegetable gum. Still, in view of Audubon's statement, the question was one for anatomists to settle.

It was, he said, worthy of remark that other species of swallow used vegetable gum for nest making. A cave-swallow of Cochin China used a gelatinous seaweed, a species of *Gelidium* not far removed from *Chondrus crispus*, the well-known Irish moss, to make their nests. This formed the so-called edible nests of China. Lamaroux, as quoted by Dr. Peyre Porcher, in his "Medical Properties of Cryptogamous Plants," remarks that far inland the birds employed other material to build their nests, but secured some of the *Gelidium* which they employed to stick the materials together, and fasten the nest to its support. The collecting of vegetable gum for this purpose is expressly conceded in the case of this species.

Meehan called attention to the
gs were coated, had evidently
the collection of the twigs;
um was softened perhaps by
in the bird's bill, so that it
s was evident by the lines of
d from the mass on the wall,
re drawn out, terminating in
the nest exhibited as being
against the face of the wall.
seemed evident from the fact
tarted from right to left and
he gum, were bent around to
the right, on account of the
of the twigs. This obliquity
d, as it provides for sitting
bird sat at right angles with
ery much in the way of her

ked that she had once had an
d at work repairing the nest
d adjusted a loose stick with
bill, using the latter in the
quietly, apparently to give
orked and rested alternately,
All this was distinctly seen
t of the bird.
of the chimney-bird and did
one side than the other, but
by Mr. Meehan, had been

uite symmetrical, and in the
particular nest to which she
two sticks vertically, and
form the open basket-work.
ten the sticks was of animal
bird itself. When fresh and
mble even in color, the gum

1882.

esident, in the chair.

don, was elected a corres-

rinted:—

RHUS COTINOIDES, NUTT.

BY CHARLES MOHR.

Since its discovery by Nuttall, in the year 1819, in Arkansas, and twenty-three years later by Prof. Buckley, in North Alabama, this tree has not been found by any other botanist, and our knowledge of it remained fragmentary and obscure.

After having been lost to the botanical world for fully forty years, its re-discovery and observation in the various stages of its growth was deemed of sufficient interest to be made a special object in my investigation of the forest growth of the Gulf region for the Tenth Census. To this end, several trips were made to the southern declivity of the Cumberland Mountains as they descend upon the valley of the Tennessee River in Madison County, Ala. On the 21st of September, a successful search for the Baily farm was made, where, in the mountains near by, Prof. Buckley found the tree in the beginning of April, 1841.[1] This place is situated near the base of a bold mountain range rising to a height of 900–1000 feet above the Tennessee River.

The sight of my botanizing capsule dimly recalled to the present owner, the Professor's visit at his father's, but he had no conception of its object. He informed me that there is a small tree found in abundance in the low foothills skirting the valley, yielding a yellow wood used for dyeing, which he considered to be the tree I was in search of; and as fine specimens could be obtained nearer by, the trouble of hauling them down the mountain could be avoided.

Great was my disappointment when the *Rhamnus Carolinianus* was pointed out to me as the yellow wood. I felt quite relieved by the forthcoming statement that there was another kind of the yellow wood found on the rocky benches near the summit of the mountain, of which his father brought down a stick over 30 years ago, to serve, on account of its strength and durability, as a cross-piece to the rack used in his slaughter-pen. On a closer examination it was found to be a kind of timber I had never seen before, and after an exposure for such a length of time was perfectly solid, sound, and to all appearances as durable as ever. No time was

[1] Proceed. Acad. Nat. Science of Phila., June, 1881.

[illegible] e mountain. The lower flanks [illegible] a rich, deep soil, are almost [illegible] incline above the clearings, [illegible] ts a fine forest of Mountain [illegible] lack Ash (*Fraxinus quadran-* [illegible] aples (*Acer saccharinum* var. [illegible] *tosa*), interspered with copses [illegible] *a*), with a dense undergrowth [illegible] *us Americana*), Black Haws [illegible] am (*Carpinus Americana*), [illegible], *Forestiera ligustrina*, etc. [illegible] limestone form on the steep [illegible] ce-like shelves traversed by [illegible] ich cover the ground, making [illegible] ult. It was upon this rocky [illegible] ation, that the coveted object [illegible] Not more than half a dozen [illegible] this locality, scattered along [illegible] g from 25–35 feet in height. [illegible] feet in length and 12 inches [illegible] nd.

[illegible] ree has evidently long passed [illegible] om the decay by which, more [illegible] cted. No sign of a decline, [illegible] igor of its vegetation.

[illegible] 12 to 14 feet above its base; [illegible] secondary branches widely [illegible], smooth and divide into [illegible] hlets rugose from the base [illegible] season. The bark is rough, [illegible] is of a deep chestnut-brown [illegible] ng square scales of uniform [illegible] sed to the air turning rapidly [illegible] when bruised, a resinous sap [illegible] us odor. The wood is heavy, [illegible] e white sap wood of small [illegible] g, the deep yellow hard wood, [illegible] des of brown, imparting to it [illegible] d.

[illegible] es long, from $1\frac{1}{2}$ to 3 inches

wide, broadly ovate, obtuse, slightly emarginate, and attenuate at the base, with a strong mid-rib prominent; primary veins of a purplish color, sparsely pubescent while young; perfectly smooth later in the season; of a bright green, with a soft, glaucous hue. The panicle is open, 8 to 12 inches long, and almost as wide, with horizontally-spreading branches, which, like the common peduncle, are smooth, subtended like its crowded, numerous ultimate divisions by marcescent, finally deciduous lanceolate bracts. The flower-bearing pedicels are erect, one inch or over in length, and sparsely hirsute. The shorter, almost capillary abortive divisions, are gracefully received and bent, densely plumose by long spreading jointed hairs of a purplish tint.

Flowers perfect, minute; calyx deeply five-parted, the lanceolate lobes veined and with a mid-rib little over one-half the length of the persistent, greenish white ligulate petals, which are inserted between the sepals and the thin, broad purplish disk. Stamens short. Ovary with 3 short lateral styles. Drupe hard, oblique, semi-obcordate, $\frac{1}{8}$ inch by its largest diameter; the coriaceous brownish epicarp prominently veined and reticulated, investing closely the tough testa. Cotyledons accumbent.

The inner bark and wood are used for dyeing yellow, and it is said, also, for the production of purple tints. On this point, however, no definite information could be obtained.

Large numbers of trees were cut down during the war to procure a dyestuff much valued at the time, and full-grown ones are now quite scarce near the settlements. On account of the beauty of its wood, the tree is called Shittim-wood by the negroes, they believing it to be same which was used in the construction of the tabernacle in Solomon's Temple. The wood permits of the finest finish; the fineness of its grain, beauty of color and its hardness fit it well for inlaid work, veneering, and the manufacture of smaller articles of all kinds of fancy woodwork.

As an ornamental tree it far surpasses the European species, and will be found quite as hardy.

On the 3d of May it was found almost past blooming, a few belated flowers allowed the examination of its floral organs. On the 29th, it had fully ripened its fruit, the panicle had begun to dry up, and its pedicels were already a prey to wind and weather. In searching for the flowering tree, extensive coppices were found on the southern slope of Mount Sano, east of Huntsville, the second

[illegible] full-grown trees cut down [illegible] serve as kindling-wood. Its [illegible] a bright flame, this rare and [illegible] d to such low purposes wher- [illegible] he narrow limits to which it is [illegible] d extinction if it were not for [illegible] -growing sprouts, giving rise [illegible] uces seeds but sparingly, all [illegible] trees for transplanting failed. [illegible] y layers, judging from some [illegible], where in contact with the [illegible]

[illegible] appears principally confined [illegible] ountains, from the northern [illegible] ee, and *strictly* to the habitat [illegible] the sandstone cliffs which [illegible] lay the limestone strata, nor [illegible] re the soil is deep and rich. [illegible] specimens were first seen by [illegible] outhern bank of the stream. [illegible] ravels through the mountain [illegible] n of the Tennessee River. It [illegible] State of Tennessee, following [illegible] ntains in their northeastern

AUGUST 1, 1882.

Mr. THOS. MEEHAN, Vice-President, in the chair.

Fourteen persons present.

Summer Migration of the Robin.—Mr. THOS. MEEHAN remarked that Audubon, Nuttall, Wilson, and other eminent ornithologists, had suggested that the seasons had evidently not so much to do with the migration of birds, as the question of food, though most authors connected this question of food with the autumn or winter season. He said he had recently observed the migration of the robin (*Turdus migratorius*) in great numbers during the ten days prior to August 1, or on the evenings of those days, for the flight was from about sundown to dark. They came from the northwest, and were flying southeast. Some were but a few hundred feet, but others were so high as to be scarcely visible, which would indicate a long journey. Robins had abounded on his property in Germantown during the past spring and early summer. He might say, without exaggeration, there were many hundreds of them. On the day of this communication, August 1, it was rare to meet with one. He considered the question of disappearance wholly one of food. On his grounds there had been no rain of any consequence for two months. For two weeks past numerous trees and plants had to be kept alive by artificial watering. Examining the dry earth after the harrow, he found few signs of insect life. The cherry crop had been nearly a failure. The usual berried plants, such as dog-wood, on which they generally fed, were not ripe. There was really little for them to eat, and he had reason to believe that the same conditions prevailed all over northern Pennsylvania. In New Jersey, plants with berries were ripening, as they were also further south, and he concluded this search for food was in this instance the cause of the early migration.

Night-closing in the Leaves of Purslane.—Mr. MEEHAN noted that in the list of plants having diurnal or nocturnal motion, *Portulaca oleracea* did not appear. At sundown the leaves, at other times at right-angles with the stem, rose and pressed their upper surfaces against it. The morning expansion began with dawn, and soon after sunrise the leaves were fully expanded. Mr. Isaac Burk had also observed it, as also in an allied plant of the West Indies, *Talinum patens.*

AUGUST 8, 1882.

Mr. THOS. MEEHAN, Vice-President, in the chair.

Fourteen persons present.

Colored Flowers in the Carrot.—Mr. THOS. MEEHAN remarked

in the centre of the umbel of
ally fertile in Europe and
always found them sterile
n, when he discovered that
l of the season were fertile.
ots were sterile. This had,
laterals probably being the
ations.

1882.

ident, in the chair.

r. THOS. MEEHAN exhibited
marked on the popular fallacy
the sun. The original "sun-
stories of Clytie and Phœbus,
en that did not turn with the
It simply grew where the sun
flower till the sun had reached
art of the mythological story
continued to open its flowers
ight say, its affection for its
er fled from her to his winter
d sunflower, simply because
here is no relation between it
Yet there are peculiarities
American plains, where sun-
a great proportion of flowers
always some in other direc-
to prevent any generalization
ss being favored more than
arden, plants of *Helianthus*
n some years ago from near
always seemed to have, to a
aning, but until this season
figures early enough to be
d the first flowers open on
ortion of the flower-stalk is
ns, some quarter of an inch of
r portion, and the face of the
s subsequently found that the
osition till the last disk-floret
e days, when the whole head
ition, taking about three days
ncing to open on the 7th of

August, by the 11th there were sixty-eight flowers expanded, all facing exactly southeast on opening; but on the evening of this day, three were found which had changed around to northeast, with a slight tendency up from the horizon. On the 14th, there were seventy-three flowers open, twenty-one of which faced northeast. On examining the matter carefully, the inclination to the north was found to be due to a slight spiral or uncoiling growth during the advance from the horizontal rest to the erect position. All do not do this, but uncurve rather than uncoil. While this accounted for the northward advance, often as much as ninety degrees in a number of flowers, it still left the reason for the original facing of the flower to the southeast, among the many problems of plant-life yet to be solved. He referred to the several reasons offered in explanation of polarity in the leaves of the compass-plant, pointing out the unsatisfactory character of all of them.

AUGUST 22, 1882.

The President, DR. LEIDY, in the chair.

Ten persons present.

AUGUST 29, 1882.

The President, DR. LEIDY, in the chair.

Twenty-three persons present.

SEPTEMBER 5, 1882.

The President, Dr. LEIDY, in the chair.

Thirty-two persons present.

A paper entitled "Conchologia Hongkongensis," by T. W. Eastlake, was presented for publication.

Vitality of Fresh-water Polyps.—Dr. H. ALLEN called attention to tenacity of life as exhibited in a fresh-water polyzoon (*Plumatella vesicularia*, Leidy). The leaf of the lily on which the colony had fixed itself, had been, by accident, removed from the water of the aquarium, and had been exposed for sixteen hours to the air. The animals had apparently become dry, and the colony itself barely visible to the unaided eye. Upon being again immersed (in water that chanced to be impregnated with iron-rust), the animals revived and flourished for two weeks, at the end of which time they perished from the effects of the decay of the leaf on

[illegible] wing facts were thought to [illegible] First, that in these animals, [illegible] on may go on for a number [illegible] ntacles in the small amount [illegible] Second, that the presence of [illegible] terfere with the growth of [illegible] us *Plumatella* may be found [illegible] es not only in their plan of [illegible] taining life for long periods [illegible] water. The last-named fact [illegible] geographical distribution of [illegible]

[illegible] *ass.*—Prof. Leidy remarked [illegible] s, of which he presented a [illegible] s, Gloucester Co., Mass., is [illegible] profusion covering the rocks, [illegible] It is also common on many [illegible] h as shells of dead or living [illegible] wrecks of vessels, etc. The [illegible] from their exhibiting a [illegible] due to the difference in the [illegible] In general when isolated or [illegible] aratively broad and low, and [illegible] ent to the aperture; or they [illegible] cones, with the breadth as [illegible] When crowded more or less [illegible] narrower, cylindrical form, [illegible] thus they may become three [illegible] h, with the shape of a tubular [illegible] traight, variably curved and [illegible] ens presented exhibit the [illegible] s :—

	[illegible] nding to —	and then contracting to the mouth.
[illegible]		7
[illegible]		8
[illegible]		8
[illegible]		9
[illegible]		8
[illegible]		6
[illegible]		9
[illegible]		12
[illegible]	9	8
[illegible]	9	8
[illegible]	11	9
[illegible]	10	8

Height.	Breadth at base —	and then contracting to the mouth.
12 mm.	12	10
11	10	8
10	13	10
8	15	8

The specimens of *Littorina litorea* and of *Purpura lapillus* presented were also collected at Bass Rocks where they occurred in great abundance, and appeared to be the commonest gasteropods of the locality. The former is described in the report on the Invertebrata of Massachusetts, of Gould and Binney, but the only locality given for it is Halifax, while it is not noticed as occurring at Vineyard Sound in the report of the U. S. Commission of Fish, Pt. i, 1873.

SEPTEMBER 12, 1882.

The President, Dr. LEIDY, in the chair.

Twenty-seven persons present.

The death of Wm. H. Allen, a member, August 29, 1882, was announced.

The following were ordered to be published:—

NOTICE OF DR. ROBERT BRIDGES.

BY W. S. W. RUSCHENBERGER, M. D.

Amidst the great population of the city, the Academy is comparatively a very small body; in fact, a mere company addicted to studies in which our fellow-citizens generally take not much interest; so little, indeed, that they hardly care to understand the nature of the work done in the institution, or to appreciate its value to the community.

General literature, the drama, music, the fine arts, attract and divert the people so satisfactorily that belles-lettres writers, poets, painters and sculptors who are skilful, are almost universally admired, and become celebrated widely and attain a higher position in public estimation than unobtrusive votaries of science, whose real worth is rightly appreciated solely by the few. Only pre-eminently great scientists and naturalists acquire position among the hosts of men distinguished because they have aided in some way the progress of civilization. The merits of individuals of the rank and file, whose labors contribute largely to the success and fame of the leaders, are too frequently overlooked.

The Natural Sciences occupy a boundless field. Its cultivation is endless, and, when a society undertakes it, requires laborers of almost every variety of qualification and degree of intelligence. Properly mounting, labeling, classifying specimens in the museum, and cataloguing and arranging books in the library for ready reference may be done by persons not qualified to recognize or describe new species; yet this comparatively inferior kind of work is of much value in facilitating the labors of those engaged in other parts of the field. The discovery and definition of new genera and species, though of very great importance, are not the sole objects of the society's pursuit. Successful generalization demands a different kind of intelligence and more extensive acquirements than special description of forms.

A good name properly earned by an individual in any department of our little community is in itself a contribution to the fair reputation of the Academy; and this is worth consideration, because the good name of the institution carries with it an influence which is important to its progress and prosperity. A good

name, therefore, is among the valuables of the corporation, to be transmitted to future members, as a common inheritance. One who contributes towards the advancement of science, either directly or indirectly; who leaves the Academy in better condition because he has passed part of his life in it, is surely worthy of remembrance. Whenever one dies who has attained distinction within our little world, through his services to the common cause, a suitable record of his worth should be made, that his successors may know to whom they are indebted and be reasonably grateful. There have been and there are now members, who, on account of their contributions towards the advancement of science and the progress of the society, are entitled to more than ordinary respect—men whose conduct is worthy of admiration and imitation, at least by all those who have like scientific tastes and tendencies.

The records of the society show that among these Dr. Robert Bridges held a prominent place. A sketch of his career in the Academy only is offered here.

He was born in Philadelphia, March 5, 1806, and died in this city, February 20, 1882, at the age of very nearly seventy-six years.

Dr. Robert Bridges was elected a member of the Academy of Natural Sciences of Philadelphia, January, 1835.

His first work was an *Index of the Genera in the Herbarium*, prepared by him and Dr. Paul B. Goddard, which he presented to the Academy, August, 1835.

He was elected Librarian, June 28, 1836, and served till May 28, 1839—two years and eleven months—when he resigned. He assisted in preparing and printing the first catalogue of the library. The Academy presented its thanks to him for "the able and efficient discharge of the duties of librarian."

In the course of the years 1839–40, he served as Recording Secretary *pro tempore*, during five months.

He was elected Corresponding Secretary, May, 1840, and served till December, 1841, one year and seven months.

He was a Vice-President from September, 1850—succeeding Dr. R. Eglesfield Griffith, who died June 26—till December, 1864, fourteen years and three months, when he was chosen President. He declined re-election, December, 1865.

He was an Auditor six years, from December, 1843, till December, 1849.

He was a member of the *Publication Committee* from December, 1837, till December, 1838; and again from December, 1849, till December, 1872, when he declined re-election, having served twenty-three years. He was chairman of the committee from December, 1865, till December, 1872.

He was a member of the *Library Committee* twenty-nine years, from December, 1842, till December, 1871, and chairman of it from December, 1846, till December, 1853.

He was a member of the *Committee on Proceedings* seven years, from January, 1862, till January, 1869; and of the *Finance Committee* five years, from December, 1869, till December, 1874.

He was elected a member of the *Botanical Committee*, January, 1836; was chairman of it from December, 1846, and served till December, 1857, twenty-one years, when he declined re-election. For his official services the Academy voted him its thanks, December 28, 1841. On the 23d of May, 1843, he presented a *New Index of the Herbarium*, and one of *Menke's Herbarium*, from the Committee, a work which was long the main guide to the botanical collections.

He was elected a member of the *Committee on Entomology and Crustaca*, January, 1849, became chairman of it January, 1858, and served till December, 1865, seventeen years. He labeled, catalogued and arranged anew the collection of Crustaca according to the nomenclature and classification accepted at that time as the best.

He was nine years a member of the *Committee on Herpetology and Ichthyology*, from January, 1857, till January, 1866, and was chairman of it from January, 1860.

He was elected, January, 1866, a member of the *Committee on Physics;* became chairman of it, January, 1868, and served till May, 1876, ten years and four months.

He was a member of the *Committee on Chemistry* five years and four months, from December, 1870, till May, 1876, when all the standing committees were abolished.

Under the By-Laws adopted May 25, 1869, a Council was created. Dr. Bridges was elected a Councillor, December 28, 1869, and served till May, 1876, six years and four months.

A committee was raised, June 30, 1846, to devise means of accommodating the Duc de Rivoli's collection of birds, which had been just purchased by Dr. Thomas B. Wilson. Dr. Bridges was

appointed a member of the committee, which reported, August 4th, a plan for extending the building thirty feet westward. The report was adopted, and the committee, then made the Building Committee, was instructed to execute the plan.

Again, December 30, 1851, Dr. Bridges was appointed a member of a committee to solicit subscriptions to enlarge and improve the hall. The committee reported, January 25, 1853, that the estimated sum required had been subscribed. Dr. Thomas B. Wilson, Dr. Robert Bridges and Mr. Wm. S. Vaux were appointed a Building Committee to execute the plans of improvement. In behalf of the committee, Mr. Vaux reported, December, 1855, that the work of raising the previously enlarged building twenty-four feet had been completed at a cost of $12,263, which had been paid.

Dr. Bridges was appointed, December 26, 1865, one of a Committee of forty members to solicit subscriptions to erect a fireproof building for the use of the Academy, and he was elected, January 8, 1867, a member of the Board of Trustees of the Building Fund, and by it, January 11, 1867, a member of the Building Committee, in which he was active till the society was established in its new hall, January, 1876.

Besides serving the society as Librarian, Recording Secretary, Corresponding Secretary, Auditor, Vice-President and President, member of numerous Standing Committees, as well as of very many Special Committees, he contributed to its funds, to its library and to its museum. In all the many years of his activity he was rarely absent from the meetings of the Academy, and discharged all duties imposed upon him promptly and efficiently.

His numerous official services, presented here in summary, imply that he had the kindly respect and confidence of his fellow-members; and it may be said that the record of his labors expresses all the eulogium required. Almost all his time not occupied by his professional avocations was employed, during more than forty years, in working faithfully, disinterestedly, to promote the acquirement and diffusion of knowledge of natural history which are the chief purposes of the society. He was remarkably courteous to students, and always seemed pleased to assist them in their inquiries and pursuits. His learning was varied and extensive and minutely accurate, but he was so modest, unassuming, that it was necessary to apply to him for information to perceive the

wealth of knowledge at his command. He was an expert chemist, a good botanist, and well versed in almost all the natural sciences; yet he published little, and seldom engaged in debate. But his good sense and independent judgment, his rigid probity and loyalty to truth in every aspect, his punctual faithfulness to all obligations, his cheerful and benevolent disposition and tranquil deportment at all times, combined to render his presence in the society a beneficial influence on its progress, an influence which cannot be made manifest by instances or definitely measured.

His interest in the Academy was unremitting till the close of his life. After impaired health prevented him from being active in its affairs and from being present at the meetings, he often found recreation during the day in passing hours reading in the library.

The Academy has had among its members many distinguished, and some wealthy and beneficent friends, but none more constant, none who has worked more industriously and efficiently for its advancement than Dr. Robert Bridges. His givings to it were as generous as his comparatively narrow circumstances justly allowed. No striking invention, no discovery in science is ascribed to him, but laboriousness, sincerity of purpose and faithfulness were so manifest in all his ways that he had the confidence of all. He earned for himself a good name in the society, and is entitled to be long remembered among us, kindly and respectfully.

CONCHOLOGIA [illegible].

BY F. W. EASTLAKE.

The recent publications of Dr. O. F. von Möllendorff and Père Heude, S. J., have thrown a new light on the conchology of the Yangtze-kiang River, and some of the provinces of Southern China, in a very welcome manner. The land, whose conchology found its pioneers in Swinhoe and Fortune, is becoming daily better known to the scientists of Europe. Indomitable energy and steady perseverance on the one hand, together with the keen eye of the scientific traveler on the other, are establishing the zoology of China—immense as is that country—on a firm scientific basis. Still there is a wide field for investigation. The transition stages of the zoology of Central Asia and that of Western China have yet to be carefully examined. Again, some branches have been almost totally neglected. The [illegible] of China is only known through the medium of [illegible] of China," a work which at present [illegible] value than that of a child's picture-book. [illegible] logy was still worse represented. A few remarks in the [illegible] of passing scientists, a chapter or two in the [illegible] occasional expeditions, a short paper in the [illegible] zoological societies—these were the only [illegible] knowledge of the conchology of China [illegible].

Under these circumstances the [illegible] concernant l'Histoire Naturelle de l'Empire Chinois [illegible] welcome, and great credit [illegible] les Mollusques de la [illegible] refrain from regretting that [illegible] a work without [illegible] neglect which is strange [illegible] similar genera [illegible] known species. In the [illegible] Heude's *Clausilia* [illegible] *aculus*, Benson [illegible] Swinhoe, and [illegible] Heude's work [illegible] shells of the Yangtze-kiang.

Of far greater scientific value are Dr. von Möllendorff's papers, which have appeared in the publications of the "Malakozoologische Gesellschaft," of Germany, and in the Transactions of the Bengal Branch of the Royal Asiatic Society. Von Möllendorff is a thorough scientist, and his new work on the "Conchology of Southern China" (shortly to appear) promises to be indispensable as a text-book.

It is remarkable that the Island of Hongkong should have produced so many indigenous species. A British possession for more than thirty years, hardly one scientific expedition has touched the shores of this "barren rock in the ocean," without discovering a new species. Of late years, Drs. von Möllendorff, Hungerford, and the writer, have carefully gone over the greater part of the island, not only discovering new species, but rediscovering others which had disappeared since Stimpson's visit to Hongkong—nearly thirty years ago.

There are only a very few places where shells are to be found, as the larger part of the island consists of naked rocks, or is sparsely covered by *Gleichenia dichotoma*—a fern which is a sure indication of the absence of terrestrial mollusca. In the valleys, however, vegetation is luxuriant, and it is in these places that most of the shells are to be found. The dense woods of Little Hongkong (a Chinese village about 6 miles from the colony), and the little valley near Sheko (10 miles from the colony), are favorite resorts for collectors. Curiously enough, one of the highest peaks on the island, known as High West (1608′) is the only place where some of the rarest species are to be found, in especial *Helix pulvinaris*, Gould, and *Cyclotus Chinensis*, Pfeiffer. The whole eastern side is covered with a dense growth of small ficus, acanthaceæ, and orchidaceous plants, and these, protected from the violence of the northeast monsoon, form a favorite shelter for the mollusca. Unluckily, the peak is only accessible from the south, and thus almost the entire eastern side is beyond reach. Still, one can descend safely thirty or forty yards below the peak, although great precaution is necessary, for granite boulders abound, and the slippery, as well as insecure footing these afford, renders a greater descent impossible.

The following is a rough list of the land snails found on the island:—

Cyclophorus exaltatus, Pfeiffer — Little Hongkong.

This is the commonest species of the Cyclostomidæ, and is not confined to the island, having been found by the writer some distance in the interior of the Kwang-tung province. Found in Hongkong by Fortune; later by E. von Martens. Reeve, in his Conchologia Iconica confounds *C. exaltatus* with *C. volvulus* (*lituus*) from Siam. That they resemble each other is true, but *C. exaltatus* is always smaller, the shell is thinner and without a ridge about the umbilicus. Closely related to this species is *C. Martensianus*, v. Mlldff., found at Kiu-kiang by von Möllendorff and Père Heude; by the writer at the Yung-fu monastery, Fukien province. Cf. Jahrb. I, 1874, p. 78; II, 1875, p. 120. E. von Martens, ibid., p. 127.

Cyclophorus pellicosta, von Möllendorff. — High West.

Originally described from the Lo-foo-shan, a range of mountains near Canton City. Rare.

Cyclophorus trichophorus (Craspedotropis), v. Mlldff. — Little Hongkong

Described originally from the Lo-foo-shan, near the monastery of Washau. Since found by Dr. von Möllendorff at Ding-hu-shan (Kwang-tung province), and at Little Hongkong by the writer.

Cyclophorus (Leptopomoides) cuticosta von Mlldff.

Found first in Hongkong by Drs. von Möllendorff and Hungerford, again at Tong-chow, not far from Macao, by Dr. Hungerford and the writer; finally, near the monastery of Yung-fu, in the Fukien province, by the writer.

Cyclotus Chinensis, Pfeiffer. — High West.

Had disappeared since 1850; rediscovered by Dr. von Möllendorff.

Alycaeus pilula, Gould.

For many years this shell was supposed to have disappeared from Hongkong, but it was the writer's good fortune to find a solitary specimen on High West (July 16, 1882), a description of which will shortly be published by Dr. von Möllendorff. E. von Martens (Jahr. II, 1875, p. 127), writes that the species is not known to him either through an engraving or any specimen. It is closely allied to *Alycaeus Kobeltianus*, found by von Möllendorff at Kin-kiang.

Besides the list given above there are two Microcystis, as yet unnamed. One *Microcystis* (*Eastlakeana*, v. Mlldff.), found by the writer near Little Hongkong; the other tolerably common on old walls and trees throughout the N. E. portion of the island. Also one *Conulus*, frem High West, undescribed.

Fresh-Water Snails.

Limnæa ollula, Benson.	Streams near L. Hongkong.
Limnæa plicatula, Benson.	Streams near L. Hongkong.

This latter species is by far the rarer of the two. A variety of *L. plicatula* has been found by Dr. v. Möllendorff and the writer on the mainland, some twenty miles from Hongkong.

Planorbis compressus, Benson.	Streams near Aberdeen.
Planorbis Cantori, Benson.	Victoria Peak.
Corticula lutea, Morelet.	Near Sheko.

Of slugs there are only two species found on the island.

Philomicus bilineatus, Benson.
Vaginulus chinensis, v. Mlldff., nova species.

Pallium supra confertim minute granulatum, obscure cinereo-fuscum, maculis pallide fusco-flavidis ad margines crebrioribus sparsum, medio striga flavida parum distincta notatum, infra pallide flavogriseum, unicolor, pes flavidus. Tentacula superiora nigra, inferiora pallida.

Pallii long. 75, lat. 15; pedis lat. 5, tentac. sup. 6, inf. 3 mm. In hortis insulæ Hongkong.

SEPTEMBER 19, 1882.

The President, Dr. LEIDY, in the chair.

Thirty-four persons present.

A paper entitled "Verification of the Habitat of Conrad's Mytilus bifurcatus," by R. E. C. Stearns, was presented for publication.

SEPTEMBER 26, 1882.

The President, Dr. LEIDY, in the chair.

Twenty persons present.

A paper entitled "Rotifera without Rotary Organs," by Prof. Jos. Leidy, was presented for publication.

On the Tobacco-worm, etc.—Prof. LEIDY exhibited a collection of tobacco-worms, the larvæ of *Sphinx carolina*, which he had obtained two days ago from a tobacco-field, near Columbus, New Jersey, where they were very abundant, and had proved a great pest in the cultivation of tobacco. The worms collected presented a number of well-marked varieties, which were supposed to be all of the same species. The principal ones were indicated as follows:

1. Pea-green or yellowish green, more or less finely hairy, with lateral oblique white bands bordered above with black dots which extend to the dorsal median line; head bright pea-green, dorso-caudal spine red. This is the most common variety.

2. Pea-green, smooth, with lateral oblique white bands joined in front below by horizontal white bands so as to form a series of ⊳-like marks, the apex of each joining the lower limb of the one in advance; head green; dorso-caudal spine black.

3. Grass-green, smooth, with lateral white V-like marks as in No. 2; the oblique bands bordered above by blackish or brownish; upper part, especially in front, more or less dotted with white; head green, with a pair of black bands on each side; dorso-caudal spine black.

4. Yellowish green, annulated with narrow black lines; with lateral white V-like marks, the oblique bands bordered above with black; head bright pea-green; dorso-caudal spine red.

5. Dull green, with more or less brown dorsally and dotted with white, the dots more or less tuberculate, but otherwise smooth; with lateral white V-like marks, the oblique band bordered above with brown ascending to the dorsal median line; head green with a lateral pair of black bands; dorso-caudal spine black.

6. Chocolate-brown to nearly black, smooth, with white dots dorsally and anteriorly, with lateral white V-like marks; head shining black on each side; dorso-caudal spine shining black.

7. The same as No. 6, with lateral red V-like marks.

Among these more marked varieties others were noticed which were more or less of an intermediate character. The most common variety was that which was least distinguishable in color from the animal's location, the tobacco-leaf, so that it was especially favored in its preservation.

Prof. Leidy further remarked that the past season had appeared to be favorable to many of the Lepidoptera. Our shade-trees had been greatly ravaged by the *Orgyia;* many of the poplars had suffered from the *Clostera inclusa*, and he had observed an unusual quantity of the Ailanthus silk-worm, *Attacus cynthia*, upon the Ailanthus-trees. The latter was introduced here in 1861, by Dr. Thomas Stewardson.

Dr. Wm. M. Gray was elected a member.

OCTOBER 3, 1882.

The President, Dr. LEIDY, in the chair.

Twenty-seven members present.

Apparent Bird Tracks by the Sea-shore.—Mr. THOMAS MEEHAN called attention to what appeared to be the track of a three-toed bird in the sand, near low-water mark, at Atlantic City. They were generally regarded by observers as bird tracks. While looking at them, recently, he noted that there were no birds about to make such recent tracks, and also that the tracks would have to be made in every case by a bird facing the water, which, in the nature of things, would be improbable. While reflecting on this, he noted on the face of the smooth receding waves, spots where the water sparkled in the light, and he found this was caused by little riplets as the wavelet passed down over the half exposed bodies of a small crustacean, *Hippa talpoidea*, and that the water in passing over the bodies, made the trifid marks which had been taken for impressions of bird's feet. This little creature took shelter in the sand near low-water mark, and entered head foremost in a perpendicular direction downwards, resting just beneath the surface. The returning wave took some of the surface sand with it, and thus the lower portions of the bodies, uppermost in the sand, were exposed. Often the creatures would be entirely washed out, when, recovering themselves, they rapidly advanced in a direction contrary to the retreat of the wave, and entered the wet sand again as before, their sides being parallel with the shore. The body terminated in a caruncular point which, with the posi-

tion of the two hind-legs, made a tridentate obstruction to the sand brought down by the retreating wave, and the water passing around the points made the three toe-like grooves which resembled a bird's foot from one and a half to two inches long. The creatures in their scrambles for protection beneath the sand, managed to keep at fair distances from each other, and hence there was considerable regularity in the tracks as if they had really been produced by birds.

He added that he presented the observation as a mere trifle, but he could not help remarking that if by any means these trifid impressions should get filled with mud, and the deposit become solid rock, it would be very natural for observers, ignorant of their origin, to mistake marks like these for the tracks of birds.

Scent Organ of Papilio.—Mr. H. SKINNER remarked that the larvæ of *Papilio turnus* and *P. troilus* when irritated, project from a slit in the prothoracic segment, an orange-colored bifid organ. The apparatus is a scent organ, and gives out a strong and disagreeable odor perceptible at some distance, and seems to be designed to defend the caterpillar from numerous enemies.

The anatomy of the organ seems to have escaped investigation, as most authors merely mention its existence, one describing it simply as fleshy. It has the appearance of being a solid organ, but it is in reality hollow throughout the entire extent, and of very thin texture, tapering gradually to a point. It is drawn in by invagination, and is protruded after the same method. If the larvæ be held so that the sunlight may pass through the extended organ, the process of intussusception may be distinctly seen.

Asymmetry of the Turbinated Bones.—Dr. HARRISON ALLEN, in the course of remarks on the asymmetry of paired structures in mammals, invited the attention of the members to asymmetry in the inferior turbinated bones of the human subject. This asymmetry may exist independently of the deflection of the nasal septum, and may involve the entire length of the bones. The nasal chamber may also be asymmetrical, and even the choana of one side be much smaller than the space of the opposite side. It was thought that such asymmetry involving the pterygoid processes of the sphenoid bones, was due to early and probably pre-natal influences, as opposed to the asymmetry due to acquired deflection of the septum.

Some peculiarities of the floor of the nose which have not been described, were defined. Among these was mentioned the elevation of the premaxilla as it lies on the floor of the nose above the level of the horizontal plate of the superior maxilla. This elevation tended to conceal the inferior turbinated bone from inspection from the anterior nares. Some forms of obstruction to nasal respiration in man were thought by the speaker to be due to the conformation of the parts as described. A peculiar thickening of

the horizontal plates of the palatal bone, which was thought to be within the range of normal variation, was next mentioned.

The erectile character of the mucous membrane of the nasal chambers, while best developed upon the middle and turbinated bones, is also present about the organ of Jacobson. This phase of the erectile tissue, while rudimental in the human subject, is highly developed in the lower mammals, and is especially conspicuous in the domestic cat. Microscopical sections of the organs with their related erectile masses were exhibited, and attention invited to the probable use of the masses in guarding the anterior orifices of the nasal chambers. The erectile tissue may be said to open or close the orifices from within as the adductor and the abductor muscles of the wings of the nostrils may close or open them from without.

The following were ordered to be printed :—

VERIFICATION OF THE HABITAT OF CONRAD'S MYTILUS BIFURCATUS.

BY ROBERT E. C. STEARNS.

In the late Dr. Philip Carpenter's Report to the British Association (1856) on the Mollusca of the West Coast of North America, paragraph 39, occur these words:

"During the years 1834–5, Thomas Nuttall, Esq., for many years Professor of Natural History at Harvard University, Cambridge, U. S., visited the then almost unsearched shores of California, by a journey across the Rocky Mountains, under the escort of a trading company. Although his object was principally botanical, his love of natural science induced him to collect all the shells he could meet with; and with such good success, that many of his species have not to this day been again discovered. The peculiar interest attaching to his researches is, that he did not visit any part of the coast north of Oregon or south of San Diego. There is no danger, therefore, of any admixture with the shells of the Gulf district; and his collections may be regarded as the type of the Californian fauna strictly so-called. Leaving the American shores, Mr. Nuttall visited the Sandwich Islands, whence he only brought one species belonging to the American fauna, viz., *Hipponyx Grayanus*, on a *Pinna*.

"On his return to the United States, *via* Cape Horn, the description of the marine shells was undertaken by Mr. T. A. Conrad, and the land and fresh-water species by Mr. Lea. The latter gentleman communicated his paper to the American Philosophical Society, where it will be found in the 'Transactions,' vol. vi; Mr. Conrad read his paper before the Academy of Natural Sciences of Philadelphia, in January and February, 1837. It is published in the second part of the 'Journal' of the Society, vol. vii, pp. 227–268.

* * * * * * *

"The work bears the appearance of undue haste, * * * the localities cannot always be depended upon, * * * and the descriptions being in English would not have been entitled to claim precedence, were it not that they are accompanied by tolerably recognizable figures." [1]

[1] Jour. Ac. N. S., v. 7, Pl. 18, f. 14. Sp. 2184, Jay's Cat., p. 77, 4th ed., 1852.

R. I., I observed a Rotifer apparently devoid of rotary organs, which I took to be the *Lindia* of Dujardin.

However, even previously to Cohn's communication (see these Proceedings, 1857, 204), I described an animal which I regarded as a Rotifer, without doubt entirely destitute of the characteristic rotary organs or any trace whatever of vibratile cilia. It was named *Dictyophora vorax;* and it is quite different in form from the preceding animals. It is spheroidal, inarticulate, without carapace, or jointed tail; and possesses a large protractile and retractile pouch or cup, as a substitute for the ordinary rotary disks. It is attached to fixed objects, and has been observed on several occasions adherent to stones and the glass of an aquarium. The description of the animal, unaccompanied by illustration, seems never to have attracted attention.

Some years subsequently, Meczinchow (Zeits. f. wis. Zoologie, 1866, 346, Taf. xix) described a similar Rotifer to mine, under the name of *Apsilus lentiformis.* It was found, at Giessen, attached to the leaves of *Nymphæa lutea.* It is larger than *Dictyophora*, and differs mainly in the possession of bristled tentacles (" Gefühlorgane ") and a ganglion to the pouch, neither of which were observed by me in *Dictyophora.*

The following year, Claparede (An. d. Sc. Nat., 1867, viii, 12, Pl. 4, figs. 3, 4) described another Rotifer, without the characteristic organs, under the name of *Balatro calvus.* It resembles the earlier described forms, and was observed to be parasitic on worms, in the River Seime, Canton of Geneva.

A short time since, Mr. S. A. Forbes (Am. Month. Micros. Jour., 1882, 102, 151), of Normal, Illinois, described a Rotifer, destitute of rotary disks, with the name of *Cupelopagus bucinedax.* It was found attached to the glass of an aquarium, and it appears to me to be so nearly like *Dictyophora vorax*, that I suspect it to be the same.

More recently, while examining some *Plumatella diffusa* from the Schuylkill River, below Fairmount dam, my attention was attracted to several groups of *Megalotrocha alba*, attached to the tubes of the former, and surrounding another animal of strange and novel character. This on examination proved to be another remarkable Rotifer, without rotary organs, and it is the interest which attaches to this discovery which has led to the present communication. As with many analagous things, I had not the

leisure to give it due study, and yet I felt that if I reserved it for future investigation, I might never meet with a more favorable opportunity for the purpose.

The new Rotifer I propose to name *Acyclus inquietus*, from its being destitute of wheels, or ciliated disks, and from its apparently restless habit. It is considerably larger than *Megalotrocha*, measures nearly a half line long, and can readily be distinguished, in groups of the latter, with the naked eye. It was observed in eight instances, in each, alone and always enclosed in a group of the *Megalotrocha*, above which, from its greater size, it towered like a giant in a crowd. In its constitution, for the most part it resembles *Megalotrocha*, and is attached in the same manner. In its movements it bends rather abruptly in different directions and curves downward so as to bring its prehensile mouth on a level with the currents produced by the rotary disks of the surrounding Megalotrochæ. Sometimes alone or in company with the latter, it suddenly contracts and then more slowly elongates and resumes its bending motions, scarcely for a moment appearing in an erect attitude. Occasionally it will even double on itself to such a degree that the extremities are approximated, or as the motion is commonly expressed, the head nearly touches the end of the tail or point of attachment. The movements of the creature recalled to me those of the avicularia of some of the marine Polyzoa, or of the pedicellaria of Echini.

At one time I had the opportunity of seeing an individual of *Plumatella* with outspread arms, and in its immediate vicinity a group of Megalotrochæ with open disks and an *Acyclus* in its midst, together with two worms of the genus *Dero*, with extended and expanded branchial tails, all acting together in concert, apparently perfectly regardless of the presence of one another—messmates partaking of the same repast.

Acyclus is translucent whitish with the thicker part of the body yellowish or brownish, due to the color of the capacious intestine shining through the integument. It was difficult to obtain a clear and accurate view of the exact mode of attachment and the internal structure of the animal, from its incessant motions, its becoming wrinkled in contraction, and from its being obscured by the surrounding bunch of Megalotrochæ. In the attempt to remove these, the *Acyclus* was detached and then would contract to such a degree, that nothing could be determined as to the arrangement

of its organs. Under the circumstances the accompanying figure 1, Plate II, of the animal, is to be regarded as only approximately correct. Most of the individuals seen were naked, like *Megalotrocha*, but had adherent a profusion of eggs. In two instances the animal was included in a copious colorless gelatinous sheath, as represented in the figure, but had also adherent a large bunch of eggs, in one of which bunches I counted upwards of fifty.

The head of *Acyclus* substitutes the rotary disk of the *Megalotrocha* and other Rotifers provided with this organ. It is in the form of a cup prolonged at the mouth into an incurved beak, as represented in figures 1–4. It is retractile and protrusile, contractile and expansile. When protruded and expanded the mouth gapes widely, and the beak becomes more extended, but always remains incurved. The mouth is bordered by a delicate membrane extending to the rounded end of the beak and presenting a festooned appearance. In contraction of the mouth the marginal membrane becomes inflected, the orifice constricted, and the beak more incurved. In contraction of the head or oral cup, it is reduced to half the bulk of its expanded condition, while the mouth is constricted and the beak is rolled in a single spiral inwardly as seen in figures 2, 3.

The extension of the head below forms a narrowed and transversely wrinkled neck which expands into the body. The expansion and contraction of the head appear to be due to the flow of a milky liquid between the cœlum or body-cavity and intervals in the walls of the oral cup or head. The retraction of the latter is produced by longitudinal muscles, which may be seen in the wall of the cup extending from the wall of the body just below the neck to the festooned membrane bordering the mouth.

The movements of the mouth with the partial extension and involution of the beak, together with the general movement of the animal, were strongly suggestive of those of the proboscis of an elephant.

The oral cavity converges in a funnel-like manner to a pouch occupying the neck. The pouch is seen to contract and expand from time to time, but it was indistinctly defined. At the bottom of the pouch there is a small mastax or muscular pharynx provided with minute jaws. These parts were but indistinctly seen, and indeed the jaws could be detected only after compressing the animal and examining it with the $\frac{1}{10}$ objective glass of the micro-

scope. The jaws are composed of a parallel series of about twenty teeth.

The body of the animal is fusiform or elliptical and narrows into a long tail, attached by the end. In contraction, the body and tail become more or less wrinkled transversely, as in *Megalotrocha*. The tail is occupied by retractor muscles extending from the walls of the body. The cavity of the latter is occupied by a capacious stomach, elliptical in shape and extending from the mastax to the root of the tail, but its mode of termination I did not detect. The anal aperture occupies a position near the latter, but its exact character I also failed to determine. The interval of the stomach and wall of the body is occupied by the ovaries and ova. In the vicinity of the lower extremity of the stomach there were several yellow spherical balls; a large one with concentric layers, and several small ones apparently of the same nature. The character of these I could not make out. An ovum was observed to be discharged in the vicinity of the anal aperture, but its outlet was not distinguished. The ova are large and oval, and exhibit no signs of segmentation at the time of extrusion.

The embryo, figs. 5, 6, developed in the egg exterior to the parent, at the time of its escape is a soft worm-like body, with a blunt head end and tapering behind to a rounded tail end in the dorsal view. The head end, not distinct from the body, is retractile; and the terminal mouth is furnished with vibratile cilia, which are also retractile. The posterior part of the body is indistinctly divided and is retractile in a telescopic manner. In the lateral view the tail end appears slightly notched or furcate, with one branch longer than the other. The head exhibits a pair of minute red eye-points, and a short distance behind, it presents a minute pointed papilla, with a still more minute bristle at the summit. The embryo swims and moves about very much in the manner of the common Rotifer, often adhering by the tail end, retracting head or tail and successively elongating.

The chief distinctive characters of the animal thus described are as follows:

Acyclus inquietus.

Body fusiform, tapering behind into a long narrow tail-like appendage, by which it is attached, not distinctly annulated, but becoming transversely wrinkled in contraction. A non-ciliated cup-like head prolonged into an incurved digitiform appendage

(as a substitute for the usual trochal disk), contractile and retractile.

Length of the animal from 1·2 to 1·5 mm.; breadth of body 0·15 to 0·21 mm. Length of head, with moderate extension of the digitiform appendage, 0·216 to 0·27 mm.; breadth, 0·15 to 0·18 mm. Ova, 0·1 to 0·133 long, by 0·06 to 0·09 mm. broad. Embryo, 0·36 mm. long by 0·06 wide at the head end.

With the figures of *Acyclus*, for comparison with this and other Rotifers devoid of trochal disks which have been described, I have given one, fig. 7, of *Dictyophora*, drawn from observation of the animal some years subsequent to its discovery. The creature was attached to objects in, and to the inner surface of, an aquarium and could not be examined advantageously; and I had deferred my investigation of the animal to a more favorable opportunity. Under the circumstances the drawing must be viewed as only approximately correct. As previously indicated, the original description of *Dictyophora vorax* occurs in these Proceedings for 1857. Since then I have had several opportunities of observing it, and it appears readily to be introduced and reproduced in an aquarium with water and aquatic plants from the rivers of our vicinity.

Dictyophora is oval or ovoid, with the narrower pole, corresponding with the position of the mouth, truncated, and it adheres by a small disk or sucker to one side of the broader pole. The animal has the power of turning on its point of attachment, but whether it has the power of detaching itself at any time I did not ascertain, though the same individual appeared after some days not to have changed its position.

The body is transparent, colorless, and even, and exhibits no signs of annulation, nor does it become transversely wrinkled by contraction. The external chitinous wall presents an appearance of scattered granules or minute tubercles. The interior exhibits the digestive apparatus and other organs, mostly more or less obscured by an accumulation of eggs in various stages of development.

From the truncated extremity of the body, the animal projects a capacious delicate membranous cup, forming more than half a sphere and more than half the size of the body. At will the cup is entirely withdrawn into the body and the orifice of this becomes contracted and puckered into folds radiating from a central point

or orifice. When protruded the cup expands outwardly like an opening umbrella, and when fully expanded equals the breadth of the body with more than half its depth. It is provided with an irregular reticulation of delicate muscles, mostly longitudinal and a few transverse, and scarcely distinguishable from wrinkles. Other muscles, acting as retractors, extend from the membranous cup to the inner wall of the body of the animal. The cup or net substitutes the ordinary trochal disks of Rotifers and appears as a most efficient means in catching the animalcules which serve as food to *Dictyophora.*

The prehensile cup opens into a capacious sac which is within the body and occupies a good portion of its upper half. The sac at bottom communicates with a mastax nearly central in position. This is provided with a pair of jaws each consisting of a larger tooth and a vertical series of four smaller ones. The jaws are observed to be in frequent motion, as usual in Rotifers.

The mastax opens into a capacious sacculated stomach of a brownish or yellowish color. The outlines of the different portions of the alimentary apparatus are difficult to make out from their being more or less obscured by the ova with embryos contiguous to them. Muscular fibres pass from the viscera to the outer wall of the cœlum, or body-cavity. Adherent to this wall there are situated at different points whitish bodies, similar to those seen in other animals of the class, the nature of which is unknown.

Numerous ova, in all conditions from the earliest to those which contain fully developed embryos, occupy the body-cavity of *Dictyophora*, sometimes in such numbers as to obscure everything else from view.

Various specimens of *Dictyophora* with extended cup measured from 0·6 to 1 mm. in length. Closed specimens from 0·35 to 0·6 mm. long by 0·28 to 0·5 mm. broad. Ordinarily the body measured from 0·45 to 0·6 mm. long by 0·35 to 0·5 mm. broad. The cup in several ranged from 0·26 to 0·5 mm. both in height and breadth.

The animal is exceedingly sensitive, and with the slightest disturbance withdraws its net. It feeds especially on smaller animalcules, and in one instance upwards of fifty of these were squeezed from the stomach.

From *Apsilus lentiformis*, which *Dictyophora* closely resembles,

it differs especially in the absence of the lateral antennæ, and the conspicuous ganglion of the cephalic cup.

While *Lindia*, *Taphrocampa* and *Balatro* may be open to the suspicion of possessing ciliary rotiform disks, which perhaps were concealed when the animals were observed, the same cannot be the case with *Dictyophora*, *Apsilus* and *Acyclus*.

As remarked by Mr. Forbes, the former name had been preoccupied; and thus if the *Cupelopagus* should prove to be the same, this name may properly supply its place.

REFERENCES TO PLATE II.

Figs. 1–6. *Acyclus inquietus*.

Fig. 1. The animal extended, enclosed with eggs, in a gelatinous sheath. Magnified 96 diameters.

Figs. 2, 3. Different degrees of contraction of the head-cup. Magnified 96 diameters.

Fig. 4. Anterior view of the head-cup. Magnified 166 diameters.

Figs. 5, 6. Front and side view of the embryo. Magnified 80 diameters.

Fig. 7. *Dictyophora vorax*. Animal with its head-cup extended. Magnified 75 diameters.

OCTOBER 10.

The President, Dr. LEIDY, in the chair.

Twenty-three persons present.

A paper entitled "Snares of Orb-Weaving Spiders," by the Rev. Henry C. McCook, was presented for publication.

OCTOBER 17.

The President, Dr. LEIDY, in the chair.

Twenty-six persons present.

On the Mode of Entrance of the Sporidia of Parasitic Fungi.—Mr. THOMAS MEEHAN exhibited specimens of *Panicum sanguinale* L., the "Crab-grass" or "Fall-grass" of the Northern States, which were infested with a species of smut, according to Mr. Ellis allied to *Ustilago juncei*,[1] but which were of interest chiefly for the light they might throw on the still disputed question, whether the sporidia of the lower forms of fungi were introduced to the infested plant from the outside, or in some way through the circulatory system. There seemed to be some difficulties in the way of the belief that the introduction could be through the roots, and the spores find their way through the plant-structure to the surface—and yet there were some positive facts on record, which, unless controverted, showed, impossible as it might seem from a physiological and structural point of view, that there were good reasons for that belief. He referred to papers by Dr. E. Queckett, in the "Transactions of the Linnæan Society," especially the one published in vol. xix, p. 137, detailing experiments with potted plants of rye and other grains watered with water in which the sporidia of the ergot had been infused. The plants so watered in every case reproduced the ergot in the grain of the growing plants—and in no case did ergot appear in the plants which had ordinary water applied to them.

The case now exhibited tended to strengthen the observations of Queckett. Usually specimens of affected grass might be found where the herbage was growing in a mass, and a person could not tell whether the specimens were all from one plant or not. In this case the specimens of *Panicum* were all growing in a cultivated field, and in tufts distinct from one another. The plant from

[1] Since this communication was made, Mr. Ellis identified the fungus with *Ustilago Rabenhorstiana*.

which these specimens were gathered, was surrounded by others, the culms of these surrounding ones interlacing those of the plant exhibited, but only this one plant was infected. He did not count the number of culms, but felt safe in saying there were over fifty. In walking through this field among many hundreds of plants of this *Panicum*, he saw only one other plant, which in like manner was infested. This had one perfect panicle only among the numerous infested ones—the interlacing branches of surrounding plants of the same species being free, as in the other instance. It was scarcely credible that sporidia of the *Ustilago*, floating through the atmosphere, settled on fifty separate culms of one plant, and not one on the culms of adjacent plants which were growing in and among them. Again, the leaves of the *Panicum* have a large spathaceous sheath, two or three inches long. The *Ustilago* attacked the panicle while closely swathed in this sheath, and fully perfected its growth entirely therein. He had indeed to unfold the sheath in order to detect the mass of "smut" to which the embryonic panicle was reduced, in order to detect its presence. Only the peculiar appearance of the grassy tuft having no inflorescence as in the case of its neighbors, drew attention to the plant in the first instance. If it seemed incredible that fifty culms interlocked with as many from other plants, should each receive a germinating spore alone, it was still more incredible that the spores should have found their way from the outside to the interior of these tightly twisted sheaths.

These observations did not prove that the sporidia entered the plant by the roots, and made their way in some incomprehensible manner through the structure to the inflorescence; but they did render the external-entrance hypothesis doubtful, and, in connection with Queckett's experiments, are possibly of some worth.

Dr. Leidy made some remarks on Mr. Meehan's communication, showing that the tendency of modern observations rather favored the view that the entrance of the sporidia of microscopic fungi was from the outside.

Sexual Characters in Cephalotaxus.—Mr. Meehan exhibited some fruit of *Cephalotaxus Fortunii*, a Chinese tree, this plant growing on the grounds of P. J. Berckmans, at Augusta, Georgia. This tree had for many years produced male flowers only. During 1882, it produced abundance of fruit. It showed that the genus was not truly diœcious, and further it afforded an illustration now not uncommon, that trees a long time of one sex only, would sometimes change to another. Sex is not an invariable characteristic in an individual tree.

A New Infusorian belonging to the Genus Pyxicola.—Prof. Leidy exhibited drawings of an infusorian, a species of *Pyxicola*, which appeared to be different from those previously described.

It is of frequent occurrence, attached to the tubes of *Plumatella*, *Urnatella* and *Cordylophora*, on stones, in the Schuylkill River, below Fairmount dam. In shape it resembles *Pyxicola pusilla* and *P. affinis*, fresh-water forms of England, but is annulate as in *P. socialis*, a salt-water form. It is represented in figs. 8 and 9, Pl. II, and presents the following characters:—

PYXICOLA ANNULATA. Lorica urceolate, slightly curved, inflated towards the middle, tapering below, cylindrical and feebly contracted at the neck, and with the aperture oblique and circular; variably annulate, mostly at the neck, often at the middle; color chestnut-brown, but colorless when young; pedicle short, always colorless. The contained animalcule is of the usual shape; with an attached operculum, which is of the same color as the lorica, and is protruded beyond this when the animal is fully extended. Length of lorica, 0.52 to 0.792 mm.; breadth, 0.02 to 0.0264 mm.; length of pedicle, .004 to .008 mm.

The following was ordered to be printed:—

SNARES OF ORB-WEAVING SPIDERS.

BY REV. HENRY C. MCCOOK, D. D.

The characteristics upon which the true spiders should be classified into principal groups have not been agreed upon by araneologists. Without entering upon the discussion I have accepted the arrangement of Prof. Thorell of Upsala, which is substantially that of Latreille, and is based upon the spinning habits of the animal. That it is open to objection, can readily be shown; but on the whole it appears more satisfactory than any other. In accordance with this arrangement we have two great groups or divisions; *first*, the Sedentary Spiders, whose habit is to remain (for the most part) upon or in their web and capture their prey by means of snares; *second*, the Wandering Spiders, who hunt their food upon the ground, the water or trees. The first division is subdivided into sections according to the general character of the web; the second, according to the chief peculiarity of the spider's action or gait.

The following tabulated statement will present this arrangement:—

CLASS ARACHNIDA.

ORDER ARANEA.

I. *First Division.*

Sedentary Spiders.

Section 1. Orbitelariæ, Orb-weavers.
" 2. Retitelariæ, Line-weavers.
" 3. Tubitelariæ, Tube-weavers.
" 4. Territelariæ, Tunnel-weavers.

II. *Second Division.*

Wandering Spiders.

Section 5. Citigradæ,[1] Citigrades.
" 6. Laterigradæ, Laterigrades.
" 7. Saltigradæ, Saltigrades.

[1] Prof. Thorell assigns the Laterigrades to the 5th section, the Citigrades to the 6th. I have ventured to so far change this arrangement as to reverse the positions of the Laterigrades and Citigrades. The Citigrades appear to me to approach the Tubeweavers, both in structure and economy, more nearly than the Laterigrades. So also the step from the Citigrades to the Laterigrades though the genus *Dolomedes* appears more natural

This arrangement, based in the main upon the economy of the animal, will be found to harmonize closely with the classification into families, genera and species based upon structural characteristics.

I propose in this paper to apply this principle of arrangement according to economy to the first section of the Sedentary Spiders—the Orb-weavers. It should be understood that the classification proposed is simply tentative, and in its present form is incomplete. It is given with the hope that it may lead to something better by fixing the attention of the very few students of our spider-fauna, among whom no such grouping has hitherto been proposed. Moreover, it is hoped that the arrangement may have some interest to naturalists generally as bearing upon the correspondence between structure and economy and the value of habit as a factor in classification.

An orb-web may be defined as a series of right lines radiating from a common centre, and crossed at intervals by other right lines attached at the points of contact and covered by viscid beads. Orb-webs are divided generally into Vertical snares and Horizontal snares, according as they are perpendicular to, or parallel with, the plane of the horizon. The Vertical snares I have subdivided into (1) Full Orb, (2) Sectoral Orb, (3) Actinic Orb, (4) Orb Sector; the Horizontal Snares into (5) Plane Orb, (6) Domed Orb. I present the following table:—

ORB-WEAVERS' SNARES.

I. VERTICAL SNARES.

Snare spun vertically; spider hanging at the centre of the converged radii, or in a silken or silk-lined den.

1. Full Orbs.

Lines crossing all the radii spirally. (Forming complete circles.)

i. *Simple Snares.*—Simple orb of radiating straight lines and concentric circles.

a. The hub meshed. *Epeira insularis*, *E. strix.*[1]

b. The hub open; central space ribboned or tufted. *Acrosoma rugosa*, *A. spinea*, *A. mitrata*, *Gasteracantha cancer.*

than the reverse, as Thorell has it; and the step to the Saltigrades from the Laterigrades is quite as, if not more, natural than from the Citigrades. From the standpoint of economy alone the passage is certainly easier.

[1] These are representative species of a large group.

c. The central space ribboned, cocoons and debris attached to the ribbon. *Cyrtophora caudata.*

ii. *Compound Snares.*—Orb partly surrounded by an irregular mass of crossed lines.

a. Central space sheeted or ribboned; wings or guards of crossed lines. *Argiope riparia*, *A. fasciata.*

b. Hub meshed; mass of line-weaving above containing the spider's home and cocoons. *Epeira labyrinthea.*

2. Sectoral Orb.

Radii crossed by lines forming nearly complete circles.

i. *Simple Snares.*

a. Hub meshed (?); the beaded spirals divided into bands by an unbeaded line and space. *Nephila plumipes.*

ii. *Compound Snares.*

a. Hub meshed; tubular den or tent in the retitelarian web. *Epeira globosa. E. thaddeus.*[1]

3. Actinic Orb.

Snare composed of several rays or orb-sectors bound together into an orb.

i. *Simple Snares.*

a. Hub wanting; a large, irregular, open central space. The radii prolonged into a trap-line. *Epeira radiosa.*

4. Orb Sector.

Snare, a sector of an orb.

i. *Simple Snares.*

a. Sector composed of four radii converging upon a single trap-line; radii crossed by notched lines. *Hyptiotes cavata.*

II. HORIZONTAL SNARES.

Snare spun horizontally; spider usually hanging beneath.

5. Plane Orb.

Snare, a circular plane.

i. *Simple Snares.*

a. Hub open. *Tetragnatha extensa; T. grallator.*

b. Hub finely notched; central space ribboned. *Uloborus riparia.*

ii. *Compound Snares.*—A maze of crossed lines spun below the orb.

a. Hub open. *Epeira hortorum; E. gibberosa.*[1]

[1] The generic classification of Hentz is here retained.

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OCTOBER 24, 1882.

MR. JACOB BINDER in the chair.

Eight persons present.

On the Habits of the Ant-Lion.—Rev. Dr. H. C. McCOOK remarked that, through the kindness of Mr. C. H. Baker, he had had an opportunity to observe closely some of the habits of the larva of *Myrmeleon obsoletus* Say. Several of these grubs had been taken from the sandy soil of New Jersey during the month of July, and brought to the Academy at Philadelphia in a large bowl. Their pits were of the usual character—an inverted hollow cone—but were sharper at the apex than usually represented. The pit is sometimes made by a backward movement of the grub upon a spiral line which gradually closes upon the centre. The body is just under the sand during this movement; and the grains of sand which fall upon the head are continually thrown upward by a sharp jerk of the head; this motion is somewhat lateral, not unlike the "butting" of a sheep or goat.

A pit is also formed by the grub while stationary, the violent ejection of the sand by the toss of the head, causing a vortex towards which the surrounding sand runs from all sides, thus naturally forming the concavity. Within this the creature lies concealed, and at once begins to toss the sand when the surface at the margin is agitated by a crawling insect. Sometimes the head and jaws are exposed; they are laid flat (as observed in these cases at least), extending horizontally and not vertically upward as is usually shown in figures. The habit may vary in this respect.

Dr. McCook believed that the popular impression that the grub throws sand after or at an ant when it appears to be escaping from the pit, is without foundation in fact. The sand is thrown up, more or less violently; so vigorously at times that it appears to boil. This motion causes agitation of the superincumbent sand, which begins to move toward the centre, carrying the ant with it into the jaws of the grub. The sand was tossed up with force enough to throw it out of the bowl to the distance of seven inches on the table, even pellets as large as grains of rice being thus ejected; but it flew in all directions, on the side opposite the ant, or upon the ant quite indiscriminately.

The smallest ants introduced had great difficulty in moving over the wall of the pit, as the sand crumbled and rolled away from beneath even the light emmet tread. One ant which escaped had a little ball of minute pellets attached to a hind foot, as though caused to adhere by moisture or some viscid substance within the pit. Others had minute grains adhering to the delicate

hairs of the body at many points. The inquiry was suggested whether there is any secretion or excretion from the grub which may produce this effect and so contribute to secure the victim.

The ants show a strange fascination for the pit, even after they have escaped. A large Carpenter ant (*Camponotus pennsylvanicus*) was seized, escaped, rushed out of the hole, then in and around it again and again, as though verily dazed. There is a vast deal of the "Paul Pry" in the emmet nature, but the ants were rarely observed to deliberately walk into the pit. They stopped upon the edge, when they reached it in course of their rambles about the bowl, threw up their antennæ and waved them restlessly, sometimes stretched a fore-foot over the brink, sometimes retreated, sometimes turned and began to circumambulate the pit. The agitation upon the sand, slight as it was, generally (not always) aroused the grub to action, and by the process already described, the sand was withdrawn from beneath the feet of the insect, who slid along with the tiny sand-avalanche into the apex. There it was seized unless, as sometimes occurred, it was fortunate enough to make its escape.

The use of the long hooked mandibles of the grub appeared in the act of seizure; the ants were held off "at arm's length," so to speak, and the grub thrashed or jerked them violently until they were exhausted. Meanwhile, the efforts at defense were made futile by the distance from any vital point at which the victim was held. *Tetramorium cæspitum*, the Pavement ant, which has a sharp sting, and tried eagerly to use it, was thus prevented from doing so and made quite defenseless. So also the formidable pincer mandibles of the Carpenter ant, by which she excavates her wooden galleries and decapitates her victims with the facility of a guillotine, are rendered entirely useless. This defenselessness is completed by the position of the grub beneath the sand. A Carpenter worker-minor seized by a hind leg bowed her body under to snap at her captor; but her jaws grasped only the gritty pellets of sand which covered the ant-lion's head and out of which the long hooks alone projected.

The point of greatest importance which Dr. McCook observed, was the confirmation of the statements of M. Bonet, concerning the behavior of the grub when its movements are obstructed by pebbles too large to be tossed out by the head. This statement having been seriously questioned,[1] the matter was tested by first dropping three pebbles, each larger and heavier than the larva within the centre of the pit. The grub having attempted to remove these in the usual manner, and failed, proceeded in this wise: It backed up to a pebble, and placed the posterior of the abdomen against, and a little beneath it, so that the sand readily dropped over the apex of the abdomen and lay between that and

[1] Rennie, Insect Architecture, p. 202. "We may be pardoned for pausing before giving full credence to these details."

the stone. A little adjustment was required to balance the pebble by getting its middle part against the end of the body, and then the animal began to back out of the pit, so pushing the pebble before, or rather behind it, up the side, and to a point a short way beyond the margin, where it was abandoned. A small furrow —two to three inches long—was described in the sand by the moving stone, which furrow was curved from the point of departure. The stone was kept perfectly balanced during the entire progress, which was quite rapid. Each of the three pebbles was thus removed, the grub returning each time and backing it out of the pit. The experiment was repeated a number of times and always with the same result. Some well-rounded stones were selected in order to make the difficulty of balancing greater, but this made no difference in the action of the larva, a round pebble being balanced and removed quite as readily as a flat one. It was a curious and amusing spectacle to witness the odd little creature thus backing the accurately poised impediments out of its domicile, and then returning to put its house in order once more. The correctness of the early observations of M. Bonet is thus fully confirmed by Dr. McCook's experiments.

OCTOBER 31.

The President, Dr. LEIDY, in the chair.

Thirty-six persons present.

The resignation of Dr. Chas. Schaeffer as Curator was received and accepted.

Actinosphærium Eichhornii.—Prof. LEIDY remarked that he had noticed in an aquarium what appeared to be eggs, adherent to the edges of the leaves of *Vallisneria*, from the Schuylkill River. On examining the egg-like bodies with a lens, they were observed to be covered with delicate rays. On transferring some of the bodies to the field of the microscope, they proved to be giant specimens of the larger sun-animalcule, *Actinosphærium Eichhornii.* They measured from three-fourths to one millimetre in diameter, independent of the rays, which extended from one-fourth to half a millimetre more. One of the smaller individuals contained four water-fleas, Daphnias, a third of a millimetre long, and one of the larger contained six of these. The *Actinosphærium* appears to be tenacious of life; several specimens having been retained alive and in good condition for three days, in a drop of water in an animalcule cage. They had discharged the Daphnias, but retained their original size. One of oval form measured 1 mm. long by 0.75 mm. broad. The smaller ones measured 0.75 mm. in diameter. After another day they appeared in good condi-

tion, but the rays were contracted so as to be about half the original length, and many had a minute granular ball at the end, apparently effete matter thrown off from them. At this time the animalcules were returned to the aquarium.

NOVEMBER 7.

The President, Dr. LEIDY, in the chair.

Thirty persons present.

The following were presented for publication:—

"A review of Swainson's Genera of Fishes," by Joseph Swain.

"Ants as Beneficial Insecticides," by the Rev. Henry C. McCook, D. D.

The deaths of Benjamin V. Marsh and Isaac Comly, M. D., members, were announced.

On Topaz and Biotite.—Prof. LEIDY exhibited several interesting minerals. One of these was a large crystal of topaz, of dark and decided amethystine hue from Brazil. The yellow topaz is the common kind and this by heating assumes a pink or rose color. He had never seen or read of another of the same color. The crystal is about 2¾ inches in length. The other mineral consisted of plates of muscovite containing hexagonal plates of biotite remarkable for their regularity and beauty. The crystals of biotite ranged from a millimetre to 50 mm. in breadth. The specimens are from Macon Co., N. C. Similar specimens are found in West Philadelphia, but he had seen none from this locality in which the crystals of biotite were so regular.

NOVEMBER 14.

The President, Dr. LEIDY, in the chair.

Thirty-two persons present.

The death of J. Norris Emlen, a member, was announced.

On Actinosphærium, etc.—Prof. LEIDY stated that *Actinosphærium Eichhornii*, on which he had made some remarks a few weeks ago, still existed in large numbers in an aquarium in his possession. The animals though in active condition appeared to be habitually sedentary, remaining adherent to the edges of leaves of *Vallisneria* and other aquatic plants, and often, as on a pedicle

to the ends of minute filamentous algæ growing from the former. The last few days he had observed a number apparently in conjugation, conspicuous for their larger size and elongated form. One apparently of two individuals was biscuit-shaped, 1.375 mm. long and 0.625 wide. Later, it assumed an oval shape and measured 1 mm. long and 0.875 wide. Another specimen, apparently of three individuals in a trefoil-like group measured 1.5 mm. long and 1.125 broad. Shortly after it assumed a biscuit form, with one lobe larger than the other and then measured the same length, with the same breadth on one side and 1 mm. on the other. Both of the above were transferred to an animalcule cage, and after twenty-four hours, three appeared in their place. One of these of lozenge shape with rounded angles measured 1.625 mm. long by 0.875 broad; a second was irregularly half-oval and 1.125 mm. long by 0.875 broad; and the third was oval and 0.75 mm. long by 0.625 broad. In the later observation they had discharged all conspicuous food.

Prof. Leidy further stated that on tubes of *Plumatella diffusa*, attached to a stone collected in the same locality as the above, he had noticed many specimens of the following forms of infusoria and rotifers.

Vaginicola crystallina.—Tube 0.1 mm. long, 0.028 broad; often containing two individuals.

Vaginicola tincta.—Tube 0.1 mm. long; at mouth 0.048 wide; just below 0.04 wide.

Limnias annulatus.—Tube 0.6 to 0.625 mm. long; 0.05 to 0.0625 wide; rotary disks together 0.2 wide.

On Tubularia, etc., from Atlantic City.—Prof. LEIDY exhibited specimens of the hydroid *Tubularia crocea* (*Parypha crocea* Ag.), which he had observed in great profusion attached to the bottom of a wreck at Atlantic City, N. J. With it he had noticed a multitude of the little sea-slug *Eolis pilata* Gould, and the skeleton-shrimp, *Caprella geometrica* Say. He further exhibited specimens of *Alcyonidium ramosum* Verrill, presented by Mr. Edward Potts, and obtained by him from stones at the inlet of Atlantic City.

The following were ordered to be published:—

ANTS AS BENEFICAL INSECTICIDES.

By Rev. Dr. H. C. McCook.

Through the courtesy of Rev. H. Corbett, a missionary of the American Presbyterian Board, at Cheefoo, China, I received a copy of the "North-China Herald," of April 4, 1882, containing an article by Dr. Magowan, of Wenchow, on the "Utilization of Ants as Grub-Destroyers in China." From this paper I quote the following sentences:

"Accounts of the depredations of the coccids on the orange-trees of Florida, induce me to publish a brief account of the employment by the Chinese of ants as insecticides. In many parts of the province of Canton, where, says a Chinese writer, cereals cannot be profitably cultivated, the land is devoted to the cultivation of orange-trees, which, being subject to devastation from worms, require to be protected in a peculiar manner, that is, by importing ants from neighboring hills for the destruction of the dreaded parasite. The orangeries themselves supply ants which prey upon the enemy of the orange, but not in sufficient numbers; and resort is had to hill-people, who, throughout the summer and winter find the nests suspended from branches of bamboo and various trees. There are two varieties of ants, red and yellow, whose nests resemble cotton-bags. The 'orange-ant feeders' are provided with pig or goat bladders, which are baited inside with lard. The orifices of these they apply to the entrance of nests, when the ants enter the bags and become a marketable commodity at the orangeries. Orange-trees are colonized by depositing the ants on their upper branches, and to enable them to pass from tree to tree, all the trees of an orchard are connected by bamboo rods.

"Is the orange the only plant thus susceptible of protection from parasitic pests? Are these the only species of ants that are capable of utilization as insecticides? Indubitably not; and certainly entomologists and agriculturalists would do well to institute experiments with a view to further discovery in this line of research."

I propose to consider whether the suggestion here raised is entitled to serious attention by economic entomologists in the United States, as likely to lead to valuable practical results.

I. In the first place it might be asked, *Are the domicile habits of ants favorable?* Ants possessing the habit of the China emmets referred to by Dr. Magowan are comparatively rare, certainly not many are known to science. Mr. F. Smith, in his Catalogue of Hymenopterous Insects in the British Museum,[1] gives figures of several fibrous nests made by arboreal species of ants, *Crematogaster* (*Pachycondyla*) *montezumia*, from Mexico, *Polyrhachis textor*, from Malacca, *Formica gibbosa*, India, and *Crematogaster arboreus*, from Port Natal. One of these, it will be observed, is a North American speeies, the only one indeed of which I have any knowledge. An Australian species, *Crematogaster læviceps*,[2] builds a pensile nest somewhat in the fashion of our hornet, upon trees. It contains a labyrinth of curved galleries and cells centering upon the interior. *Formica bispinosa*, of Cayenne, forms a nest of cottony matter from the capsules of Bombax.[3] In Brazil, this species, the *Polyrhachis bispinosus*, is popularly known as the "Negro-head Ant," the globular nest, covered on the exterior with little projections, being suggestive of close wooly hair. Smith says that the material of which it forms its nest, furnishes an article of commerce used as tinder, for lighting cigars, etc.[4] *Myrmica kirbii*, an India species described by Lieut. Col. W. H. Sykes,[5] which is apparently a species of *Crematogaster*, makes a formicary in the branches of trees out of the droppings of cows. These it spreads in thin, flaky, overlapping folia, like shingles or tiles. A dome-like roof covers the summit in an unbroken sheet, like a skull-cap on a man's head. The interior consists of a multitude of irregular cells, formed of the same material as the exterior. The "Green Ant," *Œcophylla virescens*, builds an arboreal nest of dead leaves, from which it often drops down in bevies upon travelers, very much to their discomfort. The nest is about eight inches in diameter, and is made of a leaf-pulp—as the hornet's nest is of a pulp of wood-fibre—and is hung among the thickest foliage, being sustained not only by the branches, but by the leaves which are wrought into the nest, and in parts project from the outer wall. Mr. Foxcroft discovered an

[1] Part vi, Formicidæ, Plates I, II, XIV.

[2] Smith, Catal. Brit. Mus., vol. 15, Formicidæ, p. 138.

[3] Lubbock, 1882, "Ants, Bees and Wasps," p. 24.

[4] Trans. Entomol. Soc., Lond., Ser. iii, vol. i, p. 32, 1862.

[5] Trans. Entomol. Soc., Lond., *id.*, p. 101.

African species of *Œcophylla*, which, when disturbed, swarmed in excited legions upon the outside of their papery domicile, against which they pattered so vigorously, as they moved, that the observer thought the rain was falling upon the leaves above.[1]

These are all exotic species. and I know of no American (U. S.) arboreal ants except those, like the various species of *Camponotus*, for example—the Carpenter ant—that live within the excavated wood. Any protection to the fruit wrought by these would be neutralized by the injury done the tree itself. Certain species of ants have also been reported as dwelling in the hollow interior of the spines that grow upon some of our thorny trees, like those referred to by M. Ernest André in his admirable work now going through press.[2]

Mr. W. H. Patton has described an indigenous species, *Stenamma gallarum*, as inhabiting a gall upon a dead but unbroken stock of golden rod.[3]

Ants are indeed often seen in great numbers upon trees, and moving in columns up and down the trunk and along the branches; but such are engaged in seeking food from aphides, coccids, galls, etc., and usually have their domiciles elsewhere, for the most part underground.

Mr. Smith describes a species (*Pseudomyrma modesta*), collected in Panama, which nests in the spines of a species of Acacia. The spines are three inches long, and the entrance to the formicary is a small hole gnawed near the point. There are no cells within, and this is probably (as the similar cases alluded to may be), simply an example of "squatter sovereignty."[4]

We do have indigenous ants with the habit of constructing nests of leaf-pulp, in the manner of the China species, as for example *Atta fervens* Say, and *Atta septentrionalis* McCook, heretofore described in these Proceedings. *Atta fervens*,[5] the Leaf-cutting or Parasol ant strips the leaves of various trees, reduces them to pulp, and forms nests rudely resembling those of the hornet. These nests, however, are underground, and not upon trees. As I have seen them in Texas hanging to the roots of an immense

[1] Wood, "Homes without Hands," p. 270-3.

[2] "Species des Formicides d'Europe," p. 52.

[3] Amer. Naturalist, Feb., 1879, p. 126.

[4] Trans. Ento. Soc. London, vol. i, ser. 3, p. 33.

[5] Proceed. Acad. Nat. Sci. Philadelphia, 1879, p. 33.

live oak-tree, or built up from the floor, or attached to the roof of their large subterranean caves, they quite resembled the pensile nests of the tree-ants as described by various writers. *Atta septentrionalis*[1] is a New Jersey species, and builds out of the leaves of pine nests which are little models—almost toy-like in their minute mimicry—of the Texas species. These, too, are underground, and although they have the requisite ability as to nest-making, the problem of domesticating them in the tree-tops could hardly be solved, even by an economic entomologist. It may be concluded, therefore, that if a domicile in the trees, as with the China species, be a necessary condition, we have no indigenous species upon which to experiment, either to utilize or develop a habit that will make ants so highly beneficial as insecticides as to justify any dependence upon them as protectors of fruits.

II. In the second place we may ask: *Is the food-habit of ants favorable?* Undoubtedly ants are insectivorous, or carnivorous, rather. Their food-supply is largely drawn from insects yielding sweet excretions or secretions; from the nectar and sugary exudations of plants, from fruits, from the oils of nuts, seeds, etc. They are also largely scavengers. Dead insects and animals of all kinds, refuse of many sorts afford them nutrition, but they do not limit their insectivorous tastes to mere scavenger work: they also prey upon living insects. This is true of our indigenous ant-fauna, although we have no such wholesale insecticides as the famous Eciton or Driver ant of Africa and South America, whose raiding columns clear out every living insect within their broad sweep.[2] I have seen the Mound-making ants of the Alleghenies (*Formica exsectoïdes*) preying upon our native Termite or White ant, *Termes flavipes*,[3] when the nests of this insect had been uncovered by turning up stones upon the mountains in search of specimens. It was surprising to note how quickly the Formicas appeared on the scene, seeming to dart out from behind every blade of grass, stick and stone, and leaping into the galleries that threaded the flat pit of the stone, seized with avidity the soft white Termes and made off with their prey. These ants and many

[1] Proceed. Acad. Nat. Sci. Philada., 1880, p. 359.

[2] See a full account in Belt's "Naturalist in Nicaragua," p. 17, seq., and "Naturalist on the Amazons," vol. ii, p. 350.

[3] Proceed. Acad. Nat. Sci. Philada., 1879, p. 154.

others have been seen capturing flies,[1] even on the wing, and frequently bringing home to their nests various insects, still living or recently killed.

So also the Agricultural ants of Texas,[2] have been seen after a shower to break suddenly out of their formicary, scatter throughout the foliage and return with immense numbers of living insects beaten down by the hard rain.

Forel[3] says that throughout the bounds of an ant-city of *Formica exsecta*, in Switzerland, covering many acres, he was not able to discover any other species of ant except a few nests of *Tetramorium cœspitum*, who owed their exemption to their superior agility. This is true in some measure of the allied *F. exsectoïdes*, in our mountains and the New Jersey barrens. In addition, it may be stated that ants are veritable cannibals, destroying and feeding upon not only individuals of their own family, but those of their own species. In the same connection may be mentioned a custom of American Indians to put furs and blankets infested by insects near the mounds of the Occident ant, in order to have them cleaned out by the insectivorous emmets.[4] So far, therefore, as the mere food habit is concerned, it is favorable to the idea of utilizing certain species of ants as insecticides.

III. A *third* question may be raised, viz.: *Do our ants exhibit in nature any special insectivorous habits that would make them natural protectors of crops?* This question has been considered at some length by the Agricultural Department of the United States Government in the matter of the cotton crops. In a report on Ants, prepared at the request of that department,[5] the writer reviewed the testimony gathered from many and widely separated sections as to the friendly offices of ants in destroying the eggs and larva of the cotton-worm. My opinion then was that, on the whole, those offices would hardly have an important commercial value, although to a certain extent beneficial. Many of the practical observers from whom information was collected, spoke highly of the services of the ants, especially of one, "the Cotton

[1] Mound-making Ants of the Alleghenies, p. 259.

[2] Agricultural Ants of Texas, p. 108.

[3] Les Fourmes de la Suisse, p. 207.

[4] Honey Ants of the Garden of the gods, and Occident Ants of the American Plains, p. 151.

[5] Comstock's Report upon Cotton Insects, 1879, p. 181, seq.

Ant," *Solenopsis xyloni* McCook. These ants were particularly effective against the eggs, but attacked the larva also. So good an observer as Mr. Trelease ventures the opinion that ants are probably among the most important enemies of the cotton-caterpillar. One observer went so far as to think that the ants would ultimately destroy the cotton-worm, should it prove to be indigenous rather than of foreign origin.

All the ants considered in the above-named report are mining ants, and would therefore not be available for such uses as the species of the Chinese orangeries. There appears to be no good reason, however, why they might not be useful on the orange-trees of Florida, to which State some of them are native. But it would be a necessary condition, I think, that the ants should exist in such vast numbers as to compel, under the stimulus of hunger, a thorough canvassing of every neighboring object that might shelter available prey. The value of the Chinese Orange ants appears to turn upon such conditions, viz.: their limitation to tree surfaces as a foraging field, and their vast numbers. In short, a limited supply of food and an immense demand for it, constrain the ants to the most diligent garnering and careful gleaning. On the whole there is little hope that these conditions can be met by artificial domestication of American ant fauna.

IV. *Would it be practicable to domesticate the Chinese species in America?* In answering this question I can venture no opinion as to whether it would repay orange-growers, but as a matter of experiment, merely, I think it might be practicable. Certainly some of our species are widely distributed, and probably imported. That universal pest of the housekeeper, the little red ant, *Monomorium pharaonis*, is probably a foreigner; at all events is a cosmopolite, being found in houses all over the world. Mr. Frederick Smith had reason to believe that it is a native of Brazil, whence it has been distributed in merchandise.[1] *Formica rufa*, of the Rocky Mountains, and *F. exsectoïdes*, of the Alleghenies, differ little from the European *F. rufa* and *F. exsecta*. *F. sanguinea*, the Red Slavemaker, is common to both continents, and our Shining Slavemaker, *Polyergus lucidus*, differs very little from the European *P. rufescens*. The Pavement ant, *Tetramorium cæspitum*, inhabits both hemispheres. *Pheidole megacephala*, which I have found in the neighborhood of Philadelphia,

[1] Trans. Ento. Soc., London, vol. i, 1862, p. 33.

a distribution throughout the tropical and sub-tropical regions of the entire world.

In view of these facts there is a probability at least that the [illegible] of [illegible] might be introduced and domesticated. Whether such [illegible] would be encouraged by an American Congress might have to be considered, and perhaps it would require the patience and skill of the [illegible] to successfully domesticate [illegible].

In the same connection it may be said that [illegible] species have a remarkable [illegible] they are adapted to the widely varying climatic and geographical conditions of our country. For example, [illegible] Saveweavers [illegible] the Garden of the Gods [illegible] California [illegible] found [illegible] Texas. Prof. [illegible] Orleans, and California [illegible] Throughout all these [illegible] distributed over our continent [illegible] the species of the same [illegible] Europe.

On the other hand [illegible] The [illegible] approximately [illegible] 35° N. [illegible]

[illegible]

[illegible] McCook, "The [illegible] Saveweaver," Proceed. [illegible] Phila. 1889, p. 274 [illegible].

[illegible] Fonc. [illegible]

[illegible]

McCook, [illegible]

Mississippi River. There appears to be no satisfactory reason (from a human standpoint) why these insects should not have pushed eastward much further; but some cause (quite satisfactory from an emmet standpoint) seems to have marked their bounds in the very midst of the great plains. So also the Cutting ants are—fortunately for the agriculturists—even more sharply limited to the southwest; and within the same geographical province, but with a little more elastic margin, to which the Honey ants (*Myrmecocystus melliger*) are confined. Not to multiply examples it thus appears that the question of importing and domesticating beneficial emmet insecticides is conditioned and may be prevented by the creatures' peculiar organism. The Chinese tree-ants are apparently natives of the South, the province of Canton, and it does not appear from Dr. Magowan's paper whether they have been also utilized in the northern provinces. Their domestication in our Southern States would, therefore, be favored by similar climatic conditions. Independent of such considerations, there are always natural checks and helps to the increase of insects, often of a nature so extremely complicated with other species of animal-life and the plant-world, either hostile or friendly, that experiment alone can positively determine such a result.

In answer to the question, "Could ants be transported so far with a view to trying the experiment?" I would say that I think the matter practicable. I brought several artificial colonies of Honey ants from Colorado to Philadelphia, carrying them in glass jars, feeding them a little water and sugar. These were kept during the fall and winter, but as the purpose was only to observe their habits, no effort was made to domesticate them. Large numbers of workers of the Agricultural ants were sent to me from Texas through the mails, arriving in good condition, and living throughout the winter. They were not permitted to live longer, as I did not consider myself at liberty to introduce, for other than mere experimental purposes, any insect that might possibly become injurious. Similar attempts to obtain colonies of the Cutting ants, all failed, these insects evidently not having the same vital power, at least for such conditions as a tin box and a mail-bag, as the agriculturals.

Shipments of ants from China I believe could be made, by placing workers, larvæ, eggs, and, if possible, a queen, in roomy boxes containing portions of their nests, perhaps also a little soil,

and covered with close wire-cloth. They should be fed, not too freely, with animal fats and sugar, and given water in a sponge, soaked cork, or cloth. With care there seems to be no reason why such artificial formicaries should not be safely transported from China.

In conclusion I wish to say that whatever benefits the ant may be led by domestication to confer upon man, she already is entitled to consideration as a valuable, if not valued, friend of the race. I have elsewhere shown[1] that ants fill an important place in the economy of Nature by contributing to the fertilization of the earth. In the paper referred to it appears from measurements of the amount of soil actually excavated, that insignificant in size as these insects are, the labors of countless hosts through many years are by no means insignificant in the shifting of the soil. They pulverize the ground and bring it in great quantities to the surface, thus making good topsoil for the growth of vegetation. In addition to this it is shown that the ants bring about the aëration of the soil, so needful for its productiveness. Moreover, the system of "pores" established by the galleries which everywhere perforate the ground, affords, on the one hand, free entrance for the rains into the earth, and on the other hand a series of tubes through which, by capillary attraction, the moisture may ascend to the roots of the plants. The last work of Dr. Charles Darwin[2] is devoted largely to similar habits on the part of the earth-worm; and in view of the interest which that subject has elicited, I venture to again call attention to the distinguished service wrought for the benefit of agriculture by the industrious ant. Even if that insect should not be as tractable for domestication as her Hymenopterous ally, the bee, and in spite of her occasional forays upon our cupboards and crops, the ant is worthy to stand at the head of insects beneficial to man.

N. B.—Since the above was in press I have observed that Dr. Forel, in his "Etudes Myrmécologiques" for 1879, speaks of a Mexican species of *Camponotus* (*C. senex*), in the collection of Saussure, as bearing a label inscribed "Nids de papier dans les branches"—Nests of paper in the branches. This and *Pachycondyla montezumia* make two known North American species of Tree-ants.

[1] Proc. Acad. Nat. Sciences, 1879, p. 158, seq.

[2] The Formation of Vegetable Mould through the Action of Earthworms, 1882.

...NERA OF FISHES.

...IN.

...published a general scheme
...phibians and Fishes,[1] in
... groups are defined and a
... is appended. Many new
...he consideration of which
... I give a list of the new
... by Swainson, with their
..., as I understand them.
...son to each genus is here
...ered by me as the type of
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...n to science, and of interest
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... possessed a very limited
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...is paper, have been referred
...am also indebted for other
... of his library. I am like-
...r kindly aid.

...t 1790).
...r Rüp. (nec Cuv.), i. pl. 27, f. 1.

...ttatus, Ib. f. 3,

...ns & Reptiles, or Monocardian
... F. L. S. * * * In two
...ongman, Orme, Brown, Green
... Taylor, Upper Gower Street,

...revived by Dr. Bleeker (Sys.
...his own *Serranichthys*, the type
...ecies does not agree with the

Cynichthys, p. 201 = **Plecterhynchus**[1] Lacépède (1800.)
C. flavo-purpuratus.* Frey, Atl. pl. 57, f. 2. Bennet, Ceyl. Fishes, pl. 19 (fig. 42 c).

Variola, p. 202 = **Variola** Sw. (1839).
V. longipinna* Sw. Rüp. i, pl. 26, f. 2 (*S. louti* Rüp.).

Elastoma, p. 202 = **Etelis**, C. & V. (1828).
E. oculatus* Sw. Cuv., pl. 32.

Uriphæton,[2] p. 202 = **Variola** Sw. 1839.
U. microleptes* Sw. Serranus phæton, Cuv. pl. 34).

Rabdophorus, p. 211 = **Chætodon** L. 1758, subg. **Rabdophorus** Sw.
Ephippium* Sw. Cuv. pl. 174.

Genicanthus, p. 212 = **Holacanthus** Lac. (1802).
Lamarckii,* Cuv. pl. 184. tricolor, Bloch, pl. 426.

Microcanthus, p. [illegible] = **Chætodon** L. 1758.
G. strigatus,* Cuv. pl. 170.

Microgaster, p. [illegible] = **Eurapius** C. & V. [illegible]
maculata,* Cuv. pl. [illegible]

Chrysiptera, p. [illegible] = **Chrysiododon** Lacépède [illegible]
azurea,* Frey. Atl. pl. 64, fig. [illegible] [illegible] fig. 4

Chætolabrus, p. [illegible] = **Eurapius** C. & V. [illegible]
Suratensis,* Bloch [illegible] maculatus [illegible]

Chrysoblephus, p. [illegible] = **Sparus** L. [illegible]
C. gibbiceps,* Cuv. pl. [illegible]

Argyrops, p. [illegible] = **Sparus** L. [illegible]
Spinifer,* [illegible] pl. [illegible]

Calamus, p. [illegible] = **Calamus** Sw. [illegible]
E. megacephalus* Sw. Cuv. pl. [illegible]

Lithognathus, p. [illegible] = **Lithognathus** Sw. [illegible]
L. capensis* Sw. Cuv. pl. [illegible]

Nemipterus, p. [illegible] [illegible]
N. filamentosus* Cuv. pl. [illegible]

diagnosis [illegible] and the other [illegible] *Epinephelina* and [illegible] *Epinephelina*.

[1] *Diagramma* [illegible]

[2] *Phæthon* [illegible] *Serranus phæton* [illegible] a *Fistularia* [illegible] species of *T*[illegible]

Thalassoma, p. 224 = **Thalassoma** Sw. (= **Julis** Auct. *nec* typus).
T. purpurea,* Nob. Rüpp., Atl. pl. 6, fig. 1.

Urichthys, p. 224 = **Chilinus** Lac., (1802).
U. lunulatus,* Nob. Rüpp., Atl. pl. 6, fig. 1.
quinque-cinctus, Ib., ii, pl. 5, fig. 1.

Crassilabrus, p. 225 = **Chilinus** Lac., (1802).
C. undulatus,* Rüpp., Atl. pl. 6, fig. 2.

Leptoscarus, p. 226 = **Calliodon** Gronov. (1801).
L. vargiensis,* Quoy and Gaim, p. 288.

Hemistoma, p. 226 = **Scarus** Forskæl,[1] 1775.
H. reticulata, Sw. (Scarus pepo* Benn. Ceylon, pl. 28).

Petronason, p. 226 = **Scarus**.
P. psittacus*, Rüpp. pl. 20, 1.
Rüppellii, Ib., pl. 21, 1.
bicolor, Ib., pl. 21, 3.
longicauda, Ib., pl. 21, 2.
viridis, Bl., pl. 222.
flammiceps Bennett, Ceylon, Fish, pl. 24.
niger Rüpp. Atl. ii, pl. 8, 1.
collana, Ib., fig. 2.
pulchellus, Ib., fig. 3.

Erychthys, p. 226 = **Calliodon** Bloch and Schneider (1801).
E. croicensis,* Bl., pl. 221.
quinque-fasciatus, Benn. Ceylon, pl. 23, (fig. 60).
viridescens, Rüpp., ii, 7, fig. 2.
cæruleo-punctatus, Ib., 3.

Chlorurus, p. 227 = **Scarus** Forskæl (1775).
C. gibbus, Rüpp., Atl. pl. 20, fig. 2.

Sparisoma, p. 227 = **Scarus** Forskæl, subg. **Sparisoma**[2] Swainson.
S. Abildgardii,* Bloch, pl. 259.

Amphiscarus, p. 227 = ? **Teuthis** L. (1766).
A. fuscus,* Griff., Cuv., pl. 35.

Hemiulis, p. 228 = **Chilio** Lac. (1802).
H. vittatus, Griff., Cuv., pl. 6, 1.
guttatus, Bloch, pl. 357, 1.
auratus,* Frey, Atl. pl. 54, 2.
melapterus, Bloch, pl. 296, 2.

Cynædus,[3] p. 229 = **Cynædus** Sw. (1839).
C. Tinca,* Yarr., i, 293.
cornubicus, Ib., 296.
gibbus, Ib., 298.
luscus, Ib., 300.
rupestris, Bloch, pl. 250, fig. 1.
virens? Ib., 251, fig. 2.
notatus, Ib., 251, fig. 2.

[1] *Pseudoscarus* Bleeker, 1861.

[2] = *Scarus* Bleeker.

[3] = *Crenilabrus* (not of Cuvier). Swainson observes: "M. Cuvier having expressly stated that the type of his genus *Crenilabrus* is the *Lutianus verres* of Bloch, I have so retained it, placing all the others, * * under the subgenus *Cynædus*." If this statement (which I am unable to verify) is correct, *Cynædus* Sw. must supersede *Crenilabrus*, which becomes a synonym of *Harpe*, Lac.

Astronotus,[1] p. 229 = **Astronotus** Sw. (1839).
A. ocellatus,* Spix, pl. 68.

Thalliurus,[2] p. 230 = **Thalliurus** Sw. (1839).
C. Blochii,* Bloch, pl. 260 (pl. ? 290).

Labristoma,[3] p. 230 = **Pseudochromis** Rüpp. (1835).
L. olivacea,* Rüpp., ii, pl. 2, fig. 3. flavivertex, ii, pl. 2, fig. 4.

Cichlasoma,[4] p. 230 = **Cichlasoma** Sw. (1839).
Labrus punctata,* Bloch, pl. 295, fig. 1.

Eupemis, p. 232 = **Chilio** Lac. (1802).
E. fusiformis,* Sw., Rüpp., Atl. ii, pl. 1, fig. 4.

Chloriothys,[5] p. 232 = **Thalassoma** Sw. (1839).
bifasciatus,* Bl., pl. 283.
ornatus, Ib., pl. 280.
Braziliensis, Ib., pl. 280.
lunaris, Ib., pl. 281.
cæruleocephalus, Frey., Atl. pl. 56, fig. 2.
Grayii, Sw., Ind. Zool., ii, pl. 92, 1.
Hardwickii, Benn., pl. 12.
quadricolor, Less., Atl. pl. 32, 1.
semicæruleus, Rüpp., Atl. ii, pl. 3, fig. 1.
aygula, Rüpp., Atl. i, pl. 6, 2.

Icthycallus,[5] p. 232 = **Coris** Lac. (1800).
dimidiatus, Spix, pl. 53.
chloropterus, Bl., pl. 288.
trimaculatus, Griff., pl. 45, fig. 2.
decussatus, Benn., pl. 14.
auromaculatus, Ib., 20.
semidecorata, Less., Atl. pl. 35, fig. 2.
geoffroyii, Frey., Atl. pl. 56, fig. 3.
umbrostygma, Rüpp., Atl. ii, pl. 3, fig. 2.
semipunctatus,* Ib., pl. 3, fig. 3.
cyanocephalus, Ib., pl. 286.
julis, Ib., pl. 287, fig. 1.
bivittatus, Ib., pl. 284, fig. 1.
macrolepidatus, Ib., fig. 2.
ornatus, Linn., Tr. xii, pl. 27.

Zyphothyca, p. 239 = **Gempylus** Cuv. (1829).
Z. coluber * Sw. Cuv. and Val., pl. 221.

Zanclurus, p. 239 = **Histiophorus** Lac. (1802).
Z. indicus* Nob. Cuv. and Val., pl. 229. Bloch, 343.

Polycanthus, p. 242 = **Spinachia** Fleming (1828).
P. spinachia * Sw. Yarrell, i, 87. Bloch, pl. 53, fig. 1.

[1] = *Hygrogonus*, Günther, 1862.

[2] = *Hemigymnus*, Günther, 1862.

[3] "The name of *Pseudo*-chromis is so objectionable, that I hope the learned naturalist who proposed it, will excuse me for offering another." (*Swainson.*)

[4] = *Acara*, Heck, 1840 (in part).

[5] *Chlorichthys* and *Icthycallus*, confused jumbles of species, may well be disposed of as synonyms of *Thalassoma* and *Coris*, respectively, although several other genera are represented in each.

Leiurus, p. 242 = **Gasterosteus** L. (1758).
aculeatus.* Yarr. i, 81. brachycentrus. Yarr. i, 82.
spinulosus. Ib. i, 88. pungitius. Ib. i, 85.

Chirostoma, p. 243 = **Menidia** Bonaparte (1836), subg. **Chirostoma** [1] Sw. (1839).
A. Humboldtiana.* Cuv. and Val., pl. 306,* (fig. 67).

Meladerma, p. 243 = **Elacate** Cuv. (1829).
M. nigerrima.* Russ., pl. 153. (Pedda. mottah.).

Platylepes, p. 247 = **Lactarius** Cuv. (1833).
P. lactaria.* Cuv., pl. 261.

Argylepes, p. 247 = ?
A. Indica. Russ., pl. 156. (Mitta Parah.).

Trachinus,[2] p. 247 = **Trachurus** Raf. (1810).
Alepes, p. 248 = ?
A. melanoptera * Sw. Russel, pl. 155. (Evori Parah.).

Zonichthys, p. 248 = **Seriola** Cuv. (1829), subg. **Zonichthys** Sw. (1839).
Z. fasciatus.* Bloch, pl. 341.
subcarinata. Russ., pl. 149.

Hamiltonia, p. 250 = **Hamiltonia** Sw., 1839 (= **Bogoda** Bleek.).
H. ovata.* Sw. Ham., fig. 37.
lata. Sw. Ib., fig. 37.

Platysomus, p. 250 = **Caranx** Lac. (1802), subg. **Vomer** Cuv. (1817).
Brownii.* Cuv., pl. 256.
Micropteryx *Sw*. App.
Spixii *Sw*. Spix., pl. 57.

Ctenodon, p. 255 = **Acanthurus** Forsk. (1775).
C. Rüppelii* Sw. Rüpp. 16 (fig. 74).
rubropunctatus. Rüpp. 15, 1.
lineatus *Sw*. Benn., pl. 2.
Cuvierii. C. V., pl. 289.
erythromelas. Less. Atl. 27, 1.
fuliginosus. Lesson 27, 2.

Zebrasoma, p. 256 = **Acanthurus** Forsk. (1775).
velifer* Sw. Rüpp. Atlas, pl. 15, fig. 2. Bl., pl. 427.

Callicanthus, p. 256 = **Monoceros** Bl. & Schn. (1801).
C. elegans.* (Aspisurus elegans.) Rüpp. Atl. 16, fig. 2 (fig. 75).

Xiphichthys, p. 259 = **Trichiurus** L. (1766).
Z. Russelii* Sw. Russ. i, p. 40 (p. ? 41).

Xiphasia,[3] p. 259 = **Xiphasia** Sw.
Z. setifer* Sw. Russ., pl. 39.

[1] = *Heterognathus*, Girard, 1854.
[2] Evidently a misprint for *Trachurus*.
[3] = *Nemophis*, Kaup., 1858; = *Xiphogadus*, Günther, 1862.

Ornichthys, p. 262 = **Prionotus** Lac. (1802), subg. **Ornichthys** Sw. (1839).
Carolinensis (Carolinus). Bl. 352.
punctatus* Ib., pl. 353.

Macrochyrus, p. 264 = **Pterois** Cuv. (1817).
miles.* Benn. Ceyl., pl. 9.

Pteroleptus, p. 264 = **Pterois** Cuv. (1817).
P. longicauda.* Russ. ii, pl. 133.

Pteropterus, p. 264 = **Pterois** Cuv. (1817).
T. radiatus.* Cuv. and Val.

Brachyrus, p. 264 = **Pterois** Cuv. (1817).
zebra.* Cuv. iv, p. 367.
brachypterus, Ib. iv, p. 368.

Pterichthys, p. 265 = **Apistus** Cuv. (1829).
P. carinatus.* Cuv. iv., p. 395. Israelitorum Cuv., iv, p. 396.
alatus. Russ. No. 160, B.

Platypterus,[1] p. 265 = **Tetraroge** Günther. (1860).
tænianotus.* Cuv. Lac. iv., pl. 3, fig. 2. longispinis. Ib. iv, 408.
Bourgomvillii. Ib. iv, 411. fusco-virens. Ib. iv, 409.

Trichosomus,[2] p. 265, = **Prosopodasys** Cant. (1850).
trachinoides.* Cuv. pl. 92, 1.
dracæna. Cuv. iv. p. 403.

Gymnapistes,[3] p. 265 = **Gymnapistes** Sw. (1839).
marmoratus,* Griff. Cuv., pl. 22, fig. 3.
australis, White's Voy., pl. 52, fig. 1.
Belangerii Cuv., iv., p. 412.
barbatus, Ib, 413.
niger, Ib, 415.

Bufichthys,[4] p. 268 = **Synancia** Bl. & Schn. (1801).
horrida.* Lac. ii, pl. 17 2.
grossa. Gray. In. Zool., i, pl. 97.

Trachicephalus,[5] p. 268 = **Polycaulus** Günther. (1860).
elongatus* Griff. Cuv., pl. 8, f. 3.

[1] Preoccupied by several genera.

[2] Preoccupied by *Trichosoma* Rud. Verm., 1819.

[3] = *Pentaroge* Günther, 1860. (See Bleeker, Mem. Scorpen, 7, 1876). As founded by Swainson, *Gymnapistes* contains species of *Pentaroge*, *Centropogon*, *Tetraroge* and *Prosopadasys*, all genera posterior to Swainson. *Gymnapistes*, may therefore, be properly substituted for *Pentaroge*.

[4] = *Synancidium*, Müller, 1843.

[5] Preoccupied by *Trachycephalus* Tsch. 1838 (a genus of Reptiles).

Ichthyscopus, p. 269 = **Ichthyoscopus**[1] Sw. (1839.)
U. inermis.* Cuv. iii, pl. 65.
Fosteri, Ib. 318.
cirrhosus. Cuv., Ib. 314.
lævis. Ib. 319.

Enophrys, p. 271 = **Enophrys**[2] Sw. (1839).
E. claviger,* Cuv. and Val., pl. 79, fig. 2.

Gymnocanthus, p. 271 = **Gymnacanthus**[3] Sw. (1839).
G. ventralis.* Cuv. and Val., iv, pl. 79, fig. 1.

Hippocephalus,[4] p. 272 = **Hippocephalus** Sw. (1839).
superciliosus* Pall. Sp. Zool. vii, pl. 5.
decagonus Schn., pl. 27.
quadricornus. Cuv. pl. 80.

Canthirynchus, p. 272 = **Aspidophoroides** Lac. (1802).
C. monopterygius,* Cuv. and Val., pl. 169.

Blenitrachus,[5] p. 274 = 0.

Erpicthys, p. 275 = **Salarias**, Cuv. (1817). subg. ? **Erpicthys** Sw. (1839).
Atlanticus, Cuv., ix, 322.
quadripinnis,* Rüpp., 28, 2.
Sebæ, Ib., p. 323.
castaneus, Ib., 324.
fasciatus, Ib., 324.
cyclops, Ib., 32.
niger, Cuv., xi.
frontalis, Ib., 328.
ruficauda, Ib., 328.
quadricornis, Ib., 329.
variolatus ? Ib., 346.
frænatus, Ib., 342.

Rupiscartes, p. 275 = **Salarias** Cuv. (1817).
R. alticus,* C. V. xi, 337.

Cirripectes, p. 275 = **Salarias** Cuv. (1817).
C. variolosus,* C. V., xi, 317.

Chirolophis, p. 275 = **Chirolophus**[6] Sw. (1839).
C. yarrellii,* C. V., xi, 218.

Clinetrachus, p. 276 = **Clinus** Cuv. (1817).
superciliosus,* Bl., pl 168.
perspicillatus, C. V., xi, 372.

Blennophis, p. 276 = **Clinus**[7] Cuv. (1817), subg. **Blennophis** Sw. (1839).
anguillaris,* (Clinus, do. C. V., xi, 390).
variabilis, Raff. (1810). (Clinus argentatus, C. V., xi, 354.)

[1] = *Anema* Günther, 1860, as restricted by Gill, Proc. Ac. Nat. Sci., Phila., 1861, 114.

[2] = *Aspicottus* Grd. (1854) = *Elaphocottus* Sauvage.

[3] = *Phobetor* Kröyer, 1844.

[4] Restricted by Gill, Proc. Ac. Nat. Sci., Phila., 1861, pp. 167, 259.

[5] No species mentioned, and apparently none known at the time.

[6] = *Blenniops* Nilsson, 1855 ; altered to *Carelophus* by Kröyer.

[7] Not *Blennophis* Val. of later date (about 1840) = *Ophioblennius*, Gill, 1860.

Labrisomus, p. 277 — **Clinus** Cuv. (1817), subg. **Labrisomus** Sw. (1839).
L. gobio, C. V., xi, 395.
pectinifer,* Ib., 374.
capillatus, Ib., 377.
Delalandii, Ib., 378.
linearis, Ib., 371.
variolosus, Ib., 381.
Peruvianus, C. V., xi, 383.
microcirrhis, Ib., 384.
? geniguttatus, Ib., 86.
elegans, Ib., 388.
? littoreus, Ib., 389.
latipennis, Ib., 394.

Ophisomus,[1] p. 277 = **Muraenoides** Lac. (1800).
O. gunnellus,* (Blennius gunnellus, Linn.), Yarrell, i, 239.

Ogriohodes, p. 278 = **Gobioides**, Lac. (1800).
G. Broussonetii,* Griff., Cuv., pl. 38, fig. 2.

Scartelaos, p. 279 = **Scartelaus**[2] Sw. (1839).
Sc. viridis.* Ham., pl. 32, fig. 12.
crysophthalmus. Ib., pl. 37, fig. 10.
calliurus. Ib., pl. 5, fig. 10.

Rupellia, p. 281 = **Gobius** L. (1758).
R. echinocephala.* Rüpp. Atl., i, pl. 34, fig. 3.

Amphichthys, p. 282 = **Batrachus** L. (1758).
rubigenes.* Sw. Appendix.

Salmophasia, p. 284 = **Chela** Buch. (1822).
oblonga. Sw. Ham., fig. 76. (Cyp. bacaila*).
elongata. Gray, Ind. Zool. (Cyp. cora.).

Chedrus, p. 285 = **Chedrus** Sw. (1839).
C. Grayii* Sw. Gray, Ind. Zool., pl. 2, f. 3.

Esomus, p. 285 = **Esomus** Sw. (= **Nuria** C. & V. ? 1842).
E. vittatus.* Sw. Ham., f. 88. (Daurua).

Clupisudis, p. 286 = **Clupisudis** Sw. (= **Heterotis** Ehrenberg, 1843).
C. niloticus.* Rüpp., Fish of the Nile, i, pl. 3, f. 2.

Laurida ("Aristotle"), p. 287 = **Synodus** Gronov. (1801).
L. Mediterranea *Sw.* (*Vol.* 1, *p.* 246, *fig.* 48).
foetans.* Bl. 384, f. 2.
tumbel. Ib., 430.
truncata. Spix, pl. 45.
minuta Le Sueur. (Vol. 1, p. 247, *fig.* 50).
semifasciata. Bl. 384, f. 1.
conirostra. Spix, pl. 43.
intermedia. Ib., 44.

Triurus,[3] p. 288 = **Saurida** Val. (1849).
T. microcephalus.* Russell, pl. 171.

[1] = *Gunnellus* C. & V. (1817), rejected because of barbarous origin.

[2] = *Boleops* Gill (1863), *fide* Bleeker, Esq. Syst. Nat. Gobioides, 40, 1874.

[3] Preoccupied by *Triurus* Lacép. 1800.

Mormyrnynchus, p. 291 = **Schizodon** Agass. (1829).
M. Gronoveii * Sw. Gronov. Zooph., pl. 7, f. 2.

Trichosoma,[1] p. 292 = **Thrissa** Cuv. (1817).
Tr. Hamiltonii.* Gray, Ind. Zool., i, pl. 85, f. 3.

Setipinna, p. 292 = **Setipinna** Sw. (1839).
truncata Ham., p. 241, f. 72. megalura Sw., Ib., p. 240. (*Cl. phasa.**)

Platygaster,[2] p. 294 = **Pellona** Cuv. (1817).
Pl. Africanus.* Bl. 407.
megalopterus, Russ., pl. 191.
affinis, Gray, Ind. Zool.
parva, Gray, Ind. Zool., ii. pl. f. 3.
Indicus, Russ., pl. 192.

Cypsilurus, p. 296 = **Cypselurus** Sw. (1839).
C. Nuttalii * Le Sueur. Am. Tr. ii, pl. 4, fig. 1.
appendiculatus. Wood. Ib., iv, p. 283.

Leptodes, p. 298 = **Chauliodus** Bl. Schn. (1801).
L. sloanii.* Sch., pl. 85. L. Siculus. Sw. App.

Tilesia, p. 300 = **Gadus** L. (1758), subg. **Tilesia** Sw. (1839).
T. gracilis.* Til. Piscium, i, tab. 18.

Lepidion,[3] p. 300 = **Haloporphyrus** Günther (1862).
L. rubescens * (Gadus lepidion Risso), xi, fig. 40, p. 118.

Cephus, p. 300 = **Gadus** Linn. (1758).
C. macrocephalus.* Til. Pisc., i, tab. 19.

Psetta,[4] p. 302 = **Bothus** Raf. (1810) subg. **Psetta** Sw.
P. maximus* Bloch, pl. 49.

Platophrys, p. 302 = **Platophrys**[5] Sw (1839).
P. ocellatus,* Spix and Agassiz, pl. 46.

[1] Preoccupied by *Trichosomus* Sw., p. 265, as well as *Trichosomus* Rud. Verm., 1817.

[2] Preoccupied by *Platygaster* Latr., Hym., 1809.

[3] Preoccupied by *Lepidea* Sav., Verm., 1817.

[4] The generic names *Bothus*, Raf. (1810), *Scophthalmus*, Raf. (1810), and *Rhombus*, Cuvier (1817, not of Lac. 1802), were alike based on *Pleuronectes rhombus*, L., and *Pl. maximus*, L., in all cases more particularly on the former, which may be taken as the type of each. If the *Pl. maximus*, be distinguished as the type of a genus or subgenus, it may stand as *Psetta*, Sw. *Lophopsetta*, Gill, is strictly synonymous with *Bothus*, its type being extremely closely allied to *Bothus rhombus*.

[5] = *Rhomboidichthys* Bleeker (1856).

Brachirus, p. 303 = **Euryglossa**[1] Kamp.
plagiusa, Linn. Commersoni, Russ., No. 70.
orientalis,* Sch., 157. jerreus, Russ., No. 71.
zebra, Bloch, pl. 187. Pan, Hamil., pl. 14, fig. 42.

Hoplisoma, p. 304 = **Corydoras** Lac. (1803).
H. punctata,* Bloch, 377, fig. 2.

Sturisoma, p. 304 = **Loricaria** L. (1766), subg. **Sturisoma**, Sw.
S. rostrata,* Spix and Agassiz, pl. 3.

Felichthys,[2] p. 305 = **Felichthys** Sw. (1839).
F. filamentosus, Bl., pl. 365. nodosus,* Bl. 368, fig. 1.

Cyclopium, p. 305 = **Cyclopium**[3] Sw. (1839).
C. humboldtii, Sw. (Pimelodus cyclopium,* *Auct.*)

Silonia[4] p. 305 = **Silondia** Sw. (1839).
S. lurida,* Ham., p. 160, 7, fig. 50. diaphina, Ib., p. 162.

Pachypterus,[5] p. 306 = **Pseudeutropius** Blkr. (1863).
P. Atherinoides,* Bl. 371, f. 1. punctatus, Ham., p. 196, f. 64.
luridus, Ham., p. 163, f. 62. melanurus, Ib., (*Murius*, Ham), p. 195.
trifasciatus, Ib., p. 180, f. 59.

Clupisoma, p. 306 = **Clupisoma**[6] Sw. (1839).
C. argenata,* Ham., 156, pl. 21, fig. 50.

Pusichthys, p. 307 = **Schilbe** Cuv. (1817).
P. uranoscopus,* Rüpp., Egypt., pl. 1, fig. 1, *a*, *b*.

Cotylephorus, p. 308 = **Aspredo**[7] L. (1758).
C. Blochii,* Sw. (Platys. cotylephorus, Bl. 372).

Pteronotus, p. 309 = **Pimelodus** Lac. (1803).
P. 5—tentaculatus,* Sp. and Agassiz, pl. 11.

Acoura, p. 310 = **Nemachilus** Von Hasselt. (1823).
C. obscura,* Hamilt., p. 357. argentata, Ib., 358, No. 10.
No. 9 (aberrant). cinerea, Ib., 359, No. 12.

[1] = *Euryglossa*, Kamp.; *plagiusa*, the first species mentioned, does not agree with the diagnosis, not having "*two* pectoral fins." *Brachirus* is preoccupied by *Brachyrus*, Swainson, both names being abridgments of *Brachychirus*.

[2] = *Auchenipterus*, Cuv. 1840.

[3] = *Stygogenes*, Gthr. (1864).

[4] Misprint for *Silondia* = (*Silundia*, C. & V., 1840).

[5] Preoccupied by *Pachypterus*, Sol., Col. 1833.

[6] = *Schilbeichthys*, Bleeker, 1858.

[7] = *Platystacus*, Bloch, 1801.

Canthophrys, p. 310 = **Botia** Gray (1831).
C. albescens,* Ham., Cob. No. 3. olivaceus, Ib., No. 8.
rubiginosus, Ib., No. 6. vittatus, Ib., No. 4 (aberr.).

Diacantha, p. 310 = **Botia** Gray (1831).
C. zebra,* Hamilt., pl. 11, f. 96. flavicauda, pl. 29, f. 95.

Somileptes, p. 311 = **Cobitis** L. (1758).
S. bispinosa,* Hamilt., p. 351. unispina, Ib., No. 1, p. 350.

Platysqualus, p. 318 = **Sphyrna** Raf. (1810).
S. tiburo,* Linn., Russ.,[1] pl. 12, fig. 2.

Pterocephala, p. 321 = **Dicerobatis** Blainville (1828).
P. Giorna,* Lac., v, pl. 20, 3.

Tetrosomus, p. 323 = **Ostracion** L. (1758).
T. turritus,* Bl., pl. 136.

Lactophrys, p. 324 = **Ostracion** L. (1758), subg. **Lactophrys** Sw. (1839).
L. trigonus,* Bl., pl. 35 (? 135). cornutus, Bl., 133.
bicaudalis, Ib., 132. quadricornus, Ib., 134.

Rhinesomus, p. 324 = **Ostracion** L. (1758).
R. triqueter,* Bloch, pl. 130. concatinatus, Ib., pl. 131.

Platycanthus, p. 324 = **Aracana** Gray (1838).
P. auratus,* Shaw, Nat. Miss., pl. 338.

Rhinecanthus, p. 325 = **Balistes** (1758).
ornatissimus,* Lesson, Atl., 10, 1. conspicullum, Ib., pl. 9, 1.
lineatus, Benn., Cey., pl. 10. amboynensis, In. Z., 8, 3.

Melichthys, p. 325 = **Balistes** L. (1758), subg. **Melichthys** Sw.
ringens,* Bl., pl. 152, 2. marginatus, Ib. 2, pl. 15, 1.
albicaudatus, Rüpp. 2, 16, 1. Praslinensis, Frey, Atl., 46, 1.

Canthidermis, p. 325 = **Balistes** L. (1758), subg. **Canthidermis** Sw.
angulosus,* Frey, Zool., p. 210. Gaimardii, Sw., Frey, Zool., p. 209.
oculatus, Ind. Zool., pl. 90, fig. 1.

Chalisoma, p 325 = **Balistes** L. (1758).
C. pulcherrima,* Lesson, Atl., pl. 9, fig. 2. velata, Bl. 150.

Leiurus,[2] p. 326 = **Balistes** L. (1758).
L. macrophthalmus,* Russ., p. 22.
radiatus, Bowdich, Mad., pl. 17, fig. 45.
Russellii, Ib., pl. 23.

Pachynathus, p. 326 = **Triacanthus** Cuv. (1829).
P. triangularis,* Russell, pl. 20.

[1] Said to be the young of *Sphyrna tudes* (Val.) M. & H.

[2] Preoccupied by *Leiurus* Sw., p. 242.

Psilocephalus,[1] p. 327 = **Psilocephalus** Sw. (1839).
P. barbatus,* Gray, Ind. Zool.

Cantherines, p. 327 = **Monacanthus** Cuv. (1817), subg. **Cantherines**[2] Sw. (1839).
C. nasutus,* Frey. Zool., p. 214.

Chætodermis, p. 327 = **Monacanthus** Cuv. (1817), subg. **Chætodermis** Sw.
C. spinosissimus,* Frey. Atl. pl. 45, fig. 3–8.
pennicilligerus, Cuv., Règ., An. pl. 12, fig. 3.

Trichoderma, p. 328 = **Monacanthus** Cuv. (1817), subg. **Amanses** Gray (1831–5).
T. scapus,* Lac. 1, pl. 18, f. 3. histrix, Sw., Gray, Ind. Zool.

Leisomus, p. 328 = **Tetrodon** L. (1758).
T. lævissimus,* Sch., marmoratus, Hamilt., pl. 18, fig. 3.

Lagocephalus, p. 328 = **Lagocephalus** Sw. (1839).
L. stellatus,* Bl., pl. 143. Pennantii, Yarrall, ii, 347 (? 457).

Cirrhisomus p. 328 = **Tetrodon**[3] L. (1758).
C. Sprengleri,* Bloch, pl. 144.

Psilonotus, p. 328 = **Psilonotus**[4] Sw. (1839).
P. rostratus,* Bl. pl. 146. Electricus, Ph. Tr. 76, pl. 3.

Molacanthus, p. 329 = **Molacanthus** Sw. (1839).
M. Pallasii,* Sw. Pall. Spec. Zool. pl. 4.

Astrocanthus, p. 331 = **Halieutæa** Val. (1837).
A. stellatus,* Sw., Lac. i, pl. xi, figs. 2, 3.

Phyllopteryx, p. 332 = **Phyllopteryx** Sw. (1839).
P. foliatus,* Sw. (fig. 109).

Solegnathus, p. 333 = **Solenognathus** Sw. (1839).
S. hardwickii,* Gray, Ind. Zool., i, pl. 89, f. 3.

Ophisoma,[5] p. 334 = **Congromuræna** Kaup. (1856).
obtusa,* Sw., Appendix. acuta, Sw., App.

Leptognathus, p. 334 = **Ophichthys** Ahl. (1789), subg. **Leptognathus**.
L. oxyrhynchus,* Sw., app. (vol. 1, p. 221, fig. 42).

Pterurus,[6] p. 334 = **Moringua** Gray (1831).
P. maculatus,* Ham., p. 25. Triporosa, Russ. i, No. 34.
Hardwickii, Gray, Ind. Zool.

Pachyurus, p. 335 = **Moringua** Gray, (1831).
P. linearis,* Gray, Ind. Zool. i, pl. 95, fig. 3.

[1] = *Anacanthus* Gray, 1831, not of Ehrenberg, 1817.

[2] = *Liomonacanthus* Bleeker, 1866.

[3] = *Chilichthys* Müll., 1839.

[4] = *Anosmius* Ptrs., 1855.

[5] Preoccupied by *Ophisomus* Sw., p. 277.

[6] = *Rataboura* Gray, 1831–42.

Ophichthys,[1] p. 336 = **Amphipnous** Müll. (1839).
O. punctatus,* Ham., pl. 16, fig. 4 (*Cuchia*).

Rupisuga, p. 339 = **Lepadogaster** Gouan (1770).
L. nicensis,* Sw., Risso pl. 4, fig. 10 (? fig. 9).

In his "natural arrangement" or analytical key to the groups of Fishes, Swainson introduces several names of genera of which no examples are given and which do not occur further on in the body of the text. They are here given with their equivalence found in the text:—

1. **Cichlaurus**, p. 173 = **Cichlasoma** Sw.
2. **Pteropterus**, p. 180 = **Brachyrus** Sw.
3. **Gobileptes**, p. 183 (not in text).
4. **Psilosomus**, p. 183 = **Amblyopus** Cuv.
5. **Scrophicephalus**, p. 187 (not in text).
6. **Breviceps**, p. 189 = **Felichthys** Sw.
7. **Leiodon**, p. 194 = **Leisomus** Sw.
8. **Canthigaster**, p. 194 = **Psilonotus** Sw.

These names are, in my opinion, unworthy of attention, as in no case would it be possible to understand their author's meaning, were it not for the fuller description given in the text.

[1] Preoccupied by *Ophichthys*, Ahl. (1789).

Note on the Nest of Contopus virens.—Mr. THOMAS MEEHAN exhibited a nest of the "Wood Pewee," *Contopus virens*, built on a dead branch of a black-walnut tree on the grounds of Colonel Etting, of Delaware County, Pennsylvania, showing that it was fastened to the branch by spider's webs, and that the lichens with which the nest was so beautifully ornamented, were evidently attached to the nest in the same manner. There was no evidence of the employment of "viscid saliva" in building the nest, as contended by some ornithological writers.

Mr. Meehan remarked on the great beauty of the nest of this bird, in consequence of the employment of lichens in covering the outside, and observed that so far as human knowledge had yet penetrated, no physiological advantage resulted to this bird by the great trouble it took in this ornamentation, over other birds which were indifferent to such beauty; and we were left wholly, so far, to the conclusion that a love of beauty alone actuates the bird in the preparation of its work.

Note on an Abnormal Cabbage.—Mr. J. O. SCHIMMEL exhibited a plant of cabbage, which, instead of the usual head, made a stalk nearly three feet high, with a panicle of flowers at the top.

Mr. MEEHAN remarked that only on a smaller and weaker scale, this was the normal condition of the cabbage-plant, as he had collected it on the chalky cliffs of the sea-coasts of Europe. In nature the seeds matured in spring, and, falling to the ground, sprouted and made plants at once, which took the rest of the season to prepare for flowering the next spring. But the gardener saved the seed till late in the autumn or very early spring before sowing it, and this favored the vegetative rather than the reproductive system of the plant. In this case the longitudinal growth was arrested, and if we examine the regular cabbage-head, we find ten, fifteen, or often more leaves forming a single cycle round the stem, as in all cases of arrestation of growth—forming of a cone in the pine, for instance—the number of leaves in a cycle were increased. The formation of a head of cabbage was precisely after the method of nature in the making of a pine cone, and this was brought about simply by the change of season of sowing the seed, from that provided by nature. In the case of this specimen, nature had asserted her prerogative to do things in her own way, notwithstanding the change of season by man, though she did not get her way time enough to open the flowers and perfect seed. Here we found only five leaves to a cycle, and as we saw by the overlapping bases of the leaves, which formed the cabbage-stalk, the spiral arrangement was from left round to the right, or "with the sun."

Earthworms Drawing Leaves into the Ground.—Mr. POTTS exhibited a box of earth showing the action of the earthworm

drawing weeping-willow leaves into the earth. Most of them were drawn into the earth by the petioles, which being the easiest way, is referred to by Mr. Darwin in his work on the earthworm, as exhibiting intelligence in these humble creatures.

Mr. MEEHAN remarked that, though he had seen in England leaves drawn into the earth as described by Mr. Darwin, he had never seen a case in America, until those exhibited by Mr. Potts, though for many years he had had opportunities of observations enjoyed by few. The apparent rarity of this work of the earthworm in this country was worthy of consideration in connection with the objects of the creature in performing it.

Mr. POTTS stated that the ground beneath a willow tree in his garden was unusually well stocked with earthworms, many of them of large size. The damp weather of the last week or two had brought them to the surface at a time when the willow leaves, still green and succulent, were rapidly falling. These the worms collected during the night, drawing them down into their burrows, he thought, to an average depth of one inch per day or night.

The appearance of the neighborhood by daylight was very curious. Throughout the garden-beds, the grass-plot, the gravel-walk and even along the cracks of the brick pavement, wherever their burrows had reached the surface, the busy tenants had "planted" these leaves perpendicularly, sometimes singly, frequently in tufts of six, eight or more, giving the appearance of a child's play-garden or of the slip-boxes in a gardener's greenhouse.

On digging up the tufts, worms were generally found with an extremity near the base of the leaves; and here the latter seemed moistened and frayed as by a process of feeding. The phenomenon was not entirely novel, but he had never noticed these "worm-plantings" in such numbers before.

NOVEMBER 21.

The President, Dr. LEIDY, in the chair.

Thirty-two persons present.

Remarks on Ursus amplidens.—Mr. JACOB WORTMAN called attention to a specimen originally described by Dr. Leidy in the Proceedings of the Academy of Natural Sciences, Philadelphia, for the year 1853, and republished and figured in the Journal of the Academy for the year 1856, under the name *Ursus amplidens*, from near Natchez, Mississippi.

The specimen upon which the description of the species was based, consists of the posterior portion of the left mandibular ramus, containing the third or last true molar tooth in position,

also a first true molar of the upper series, belonging to the left side of the jaw.

That this specimen is distinct from our black bear or *Ursus americanus*, there can be no doubt. Both the size and structure of the teeth distinctly forbid its reference to this species. The only differences, however, that he had been able to find between it and the typical grizzly bear, or *Ursus ferox*, consist in its smaller dimensions, and a slight exaggeration of the anterior basal lobe of the first true molar.

The geographical position of this specimen, together with this slight variation of structure, appear to have been important factors in establishing its claim to rank as a new and a distinct species.

With reference to the geographical position it may be said that there are many familiar examples of the various species of bears, enjoying a much wider geographical distribution than the existing grizzly bear or *Ursus ferox*. The black bear or *Ursus americanus* is well known to inhabit the extreme eastern and western portions of the North American continent, and ranges well to the north and the south. The polar bear or *Ursus maritimus*, inhabits almost, if not quite, the entire polar circle; and, indeed, Mr. G. Busk has in the Transactions Philos. Soc. of London, 1873, and later in Trans. Zoolog. Soc. London, for the year 1877, established the identity of *Ursus fossilis* of Goldfuss or *Ursus priscus*, Cuvier and Owen, with our existing grizzly bear or *Ursus ferox*.

In view of the fact, therefore, that the grizzly bear is now known to have inhabited Europe during Post Pliocene time, thereby greatly extending the boundaries of its present limits, little importance need be attached to a comparatively slight deviation from its present geographical range.

There is, probably, no family among the mammalia which is subject to greater variation, in size and structure, than the *Ursidæ*. The grizzly bears inhabiting the mountains of California and Oregon, are larger and more robust than those living upon the eastern slope of the Rocky Mountains. So far, indeed, is this true, that some authors have made two distinct species of them. The bear of the Rocky Mountain region is familiarly known to hunters as the "silver-tip bear," and is said to display even more pugnacity of character than the true California grizzly.

The small size of the individual under consideration is in keeping with what we should reasonably expect to find at a point considerably to the east of the present boundary of the range of this species.

The measurements of the crown of the last lower molar, are as follows: Antero-posterior diameter, ·75 inch; transverse diameter, ·60 inch. The crown of the first upper molar measures in the antero-posterior diameter ·82 inch, while in the transverse diameter it is ·64 inch.

The average dimensions of the corresponding tooth of *Ursus*

ferox, as given by Mr. Busk in Trans. Philos. Soc, 1873, p. 542, are ·92 by ·62 inch in the transverse, with a minimum dimension of ·85 by ·55 inch.

The experience of the speaker upon examination of quite a number of skulls of this species, had been to reduce the minimum dimension, recorded by Mr. Busk, which would affect the general average.

In one young but well marked specimen of *Ursus ferox*, in the collection of the Academy, the dimensions of the crown of the last lower molar are ·77 by ·62 inch. In another fully adult individual, bearing all the characteristics of the species, the measurements of this tooth are ·75 by ·57 inch. The dimensions of the first superior molar in this specimen are the same as those in the fossil specimen under consideration. It will be observed, therefore, that *Ursus amplidens* is intermediate in size between these two well defined specimens of *Ursus ferox*.

There is no character left by which we can distinguish this species, but the slight exaggeration of the anterior basal lobe of the superior molar, which is so very variable as to be almost worthless for this purpose.

Ursus amplidens is, therefore, but a variety at best, if not identical with the smaller varieties of *Ursus ferox*.

NOVEMBER 28.

The President, Dr. LEIDY, in the chair.

Forty-one persons present.

The deaths of Dr. J. F. Reinhardt and Dr. F. H. Troschel, correspondents, were announced.

Note on Zeolites from Delaware County.—Prof. GEO. A. KÖNIG communicated an observation on specimens received through Mr. A. Deshong from the Leiperville quarries. The whole of the material is from one crevice. One piece shows the association of gray quartz, yellowish grossularite, a chloritic mica, beautiful rose-red zoisite, and small crystals of heulandite, previously described by the speaker (Proceedings 1878, p. 84).

A second piece of biotite mica-schist shows in several druses seemingly botryoidal masses, which under the lens show coxcomb aggregations and are stilbite. Alongside one observes grains of zoisite surrounded by deep green, waxy Leidyite, the surface of which is generally covered with a very thin film of an undetermined greenish gray substance.

The remaining specimens show upon the same rock largely rhombohedral crystals of chabazite; some vitreous, but mostly covered by green, waxy Leidyite. This substance supports many

minute crystals of red-brown siderite and the latter passes into limonite. With these one sees sheaf-like aggregations of a zeolite, which from the form of single crystals appears to be Thompsonite. Some of these crystals are beautifully transparent, with tetragonal habitus—two opposite prismatic faces are striated longitudinally (pinakoïd), basis and macrodome are found on all individuals. The crystals are, however, very small and cannot be measured satisfactorily. Analyses* have not been made. The determinations are not, therefore, absolute, except in the case of chabazite. The resemblance of this occurrence to that of Baltimore is very striking. Thompsonite is new for Pennsylvania, chabazite and stilbite for Leiperville, in the speaker's knowledge.

Chapter V, Article 4, of the By-Laws, was amended by adding the following:—But Sections may admit persons not members of the Academy to be Contributors under such rules and on such terms as the Section may determine, always provided, that a Contributor shall not be eligible to office in a Section, or to vote on any question; and also provided, that the rights and privileges of a Contributor shall be restricted to attendance at the meetings of the Section, to the reading of original scientific papers, and to taking part in scientific discussions and proceedings exclusively, and that a Contributor shall have no other right or privilege whatever in the Academy.

F. Lynwood Garrison and Mrs. H. Carvill Lewis, were elected members.

DECEMBER 5.

Mr. THOS. MEEHAN, Vice-President, in the chair.

Twenty-five persons present.

A paper, entitled "On Uintatherium, Bathmodon and Triïsodon," by Edw. D. Cope, was presented for publication.

DECEMBER 12.

The President, Dr. LEIDY, in the chair.

Forty-five persons present.

The following papers were presented for publication:—

"An Identification of the Species of Fishes described in Shaw's General Zoology," by Jos. Swain.

"On the Value of the Nearctic as one of the Primary Zoological Regions," by Angelo Heilprin.

On Remains of Horses.—Prof. LEIDY directed attention to some specimens, which were recently sent to him for examination by the Secretary of the Smithsonian Institution. He remarked that it was commonly believed that the horse was not living in America when this was discovered by Europeans, but there is abundance of evidence to prove the former existence in this country of many species and genera of closely related forms. Among the remains of these some are undistinguishable in anatomical characters and size from the corresponding parts of the domestic horse. As this during the past four centuries has become widely and abundantly distributed over both continents, its remains have become buried everywhere, and often in the older deposits, where they are mingled with the fossils pertaining to the latter. Under these circumstances it is commonly difficult and frequently impossible to determine whether specimens submitted to us for examination are to be regarded as true fossils or comparatively recent remains. Such is the character of the specimens now exhibited.

Several consist of fragments (No. 16537–8) of the left ramus of the mandible of a horse. They were obtained at Aspinwall, Panama, by Capt. J. M. Dow; but no reference is made to the nature of the deposit in which they were found. They are well preserved, firm in texture, without fissures, and stained brown from ferruginous infiltration. One of the fragments contains the molar series nearly perfect except the first and last. They are more than half worn away and agree closely with those of the domestic horse in the same condition.

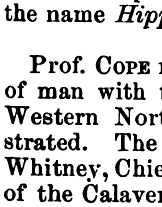
Other specimens consist of an astragalus and a first phalanx (16602, 16604) of a horse of the ordinary size. They were obtained by Mr. J. F. Le Baron, U. S. Assist. Eng., on Peace Creek, Florida, in 1881, during the survey of a steamboat route from the St. John's River to Charlotte harbor. They were discovered in association with remains of the elephant, *Elephas columbi*, and a huge turtle remarkable for the thickness of its shell, etc. The specimens are black and well preserved, but exhibit no peculiarity.

The remaining specimens are of more interest than the preceding, and consist of two bone fragments and three teeth (Nos. 1–5, 11629), which were obtained by Mr. Ellis Clarke, Jr., from near Lacualtipan, Hidalgo, Mexico. According to the accompanying letter, they were discovered in a thirty inch clay bed, lying between an upper four inch, and an under four feet stratum of coal, overlying a limestone with small shells. The fossils belong to the three-toed horse, *Hippotherium* (*Hipparion*), and are probably of pliocene age, though they may be miocene.

Of the bone fragments one is the upper extremity of a meta-

tarsal, exhibiting on each side behind the articular impressions of the smaller metatarsals. The articular end measures 13 lines transversely and 11 lines fore and aft. The other fragment is the proximal articular end of a first phalanx, measuring 14 lines transversely and 8 lines fore and aft. Of the teeth two are lower molars, apparently of different individuals. One, a fourth or fifth of the series, is little worn, but has lost its exterior cementum. It is about 2 inches long and at the triturating surface measures 9 lines fore and aft and $4\frac{1}{2}$ lines transversely. The other lower molar, probably the third of the series, is about half worn, but is broken away below, and yet retains its outer cementum. It measures 9 lines fore and aft and 5 lines transversely. The remaining tooth, the most characteristic of the specimens, is an upper molar, apparently the fourth of the series of the right side. It is but little worn, is well preserved and retains its exterior cementum. It measures about 2 inches long and at the triturating surface is $9\frac{1}{2}$ lines fore and aft and 9 lines transversely.

The specimens indicate a species about the size of *Hippotherium venustum* and *H. speciosum*, but the folding of the enamel on the triturating surface of the upper molar, as represented in the accompanying figure, is sufficiently different from the arrangement in the corresponding teeth of those species, to render it probable that the fossils belong to neither of them.



In *H. venustum* the inner column of the superior molars, so far as known, is regularly cylindrical; in *H. speciosum* it is compressed cylindrical. In the tooth under inspection it is much wider than in the latter. The fossils probably indicated an undescribed species, and for this the name *Hippotherium montezuma* was suggested.

Prof. Cope remarked that he believed that the contemporaneity of man with the horse and other extinct pliocene mammals in Western North America would soon be satisfactorily demonstrated. The first evidence on the subject was furnished by J. D. Whitney, Chief of the Geological Survey of California, in the case of the Calaveras skull, which was said to be taken from the gold-bearing gravel; and in several other cases subsequently added. From the fact that scientific observers were never present at the unearthing of the remains of man and his works from this formation, the evidence has been generally regarded as inconclusive. The gold-bearing gravel of California is, however, a very peculiar formation, and an object buried in it would carry such marks of its origin as to be quite recognizable. This was the case with the Calaveras skull when first discovered, as I am informed by Prof. Verrill of Yale College. This gentleman states that the skull, when found, was partially filled and covered with the hard adhesive "cement" so characteristic of the formation.

Prof. Cope referred to two observations of his own made in

1879 in Oregon[1] and California,[2] which were confirmatory of the existence of man in the upper pliocene of both those States, but the evidence was in neither case absolutely conclusive.

The discovery that the tracks of several species of pliocene mammalia[3] in the argillaceous sandstones of the quarry of the Nevada State Prison at Carson, are accompanied by those of a biped resembling man, is a further confirmation of these views. The tracks are clearly those of a biped, and are not those of a member of the *Simiidæ*, but must be referred to the *Hominidæ*. Whether they belong to a species of the genus *Homo* or not, cannot be ascertained from the tracks alone, but can be determined on the discovery of the bones and teeth. In any case the animal was probably the ancestor of existing man, and was a contemporary of the *Elephas primigenius* and a species of *Equus*.

Professor LEWIS drew attention to the caution that should be taken in accepting as evidences of pliocene man any facts as yet not verified by scientific observers. While the facts proving a post-glacial man are indisputable, the existence of pre-glacial man, either in our own country or in Europe, is not attested by satisfactory evidence. The discoveries in California, just referred to, made for the most part by miners in their search for gold, carry with them several serious objections to the great antiquity assigned to the relics thus found.

In the first place, the characters of the implements are identical with those of modern workmanship, while the Calaveras skull closely resembles that of a modern Indian. The implements, consisting of large granite mortars, polished spearheads of obsidian, gaming disks, finely marked pendants of greenstone and syenite, hammers, pestles, arrowheads, beads, etc., are of quite as perfect workmanship as those produced by the present aborigines of the country. No modern implements surpass the beauty of the obsidian spearheads thus found. The fact is not generally mentioned that implements in all respects similar to those of the auriferous gravel occur upon the surface of the ground, having been made by well-known tribes. Nor is the skull in any way inferior to those of the present day.

Moreover, there is no evidence of the great antiquity either of the Calaveras skull or of the implements by the amount of weathering or corrosion that they have suffered. Unlike the palæolithic implements of Europe and of Eastern America, the spearheads and mortars of the Californian gravels are as fresh in appearance as those made by modern tribes. Nor is the compact gravel adhering to the Calaveras skull a mark of great antiquity, since the formation of even more compact gravels and conglomerates may occur

[1] American Naturalist, 1880, p. 62.
[2] Loc. cit, 1878, p. 125.
[3] Loc. cit., 1881, p. 195 and 921.

in quite recent times. It is unnecessary here, in support of this fact, to more than mention the modern coins and other objects so frequently found in a compact gravel firmly cemented.

Again, there is no sufficient evidence that the gravel in which many of these relics were reported to have been found was undisturbed. Most of the implements were found on the banks of streams, some of them in the bottom of river-beds, in both of which places landslips may have occurred, while the few found in shafts have never been satisfactorily demonstrated to lie in a position which could not have been disturbed.

The very fact that these relics all occur in a gold-bearing gravel may indicate the method by which many of them were buried. That gold-mining was carried on in these same gravels by the aborigines upon an extensive scale is well attested. Schoolcraft describes an ancient shaft which penetrated Table Mountain to a depth of 210 feet, at the bottom of which were human bones and implements. This is the very locality where a number of implements and a skull of supposed pliocene man were afterwards found. Other authorities might be quoted to show the numerous mining operations of the aborigines. The mortars already described were probably used in the process of extracting gold from the gravel.

Another point of importance is the fact that the earliest relics of man, either in the river gravels of Europe and Great Britain, or in those of the Delaware, are of an ancient type, unlike those of more recent times. These *palæolithic* implements, with the associated bones of animals now extinct, are the most certain evidences of primeval man, and belong to the age immediately following the glacial epoch. It is not, therefore, probable that the highly fashioned implements of California, having the most neolithic type, belong to a race of pre-glacial men anterior to those of the river gravels of Europe. The argument from analogy is so strong against the great antiquity of the Californian relics, that evidence of the most satisfactory kind must be required to support such a conclusion.

The following was ordered to be published :—

ON UINTATHERIUM, BATHMODON AND TRIISODON.

BY E. D. COPE.

Bathmodon pachypus Cope, sp. nov.

The species originally described by me under the name of *Bathmodon radians*, was based on a number of specimens obtained by Dr. Hayden, from the Wasatch formation near Evanston, Wyoming. I subsequently ascertained that this material included two species, a larger and a smaller. The latter I described under the name of *Bathmodon latipes*[1]: for the larger the name of *Bathmodon radians* was retained. Besides various diversities between the skeletons of these species, their astragali exhibit characters which indicate that the genus *Bathmodon* is distinct from *Coryphodon*, although I have admitted their supposed identity in some of my publications[2] I pointed out the differential characters of the two genera in 1882,[3] but did not then express the most important feature. I then defined *Bathmodon* as follows: "Astragalus subquadrate, without internal hook," and *Coryphodon*, "Astragalus transverse, with internal hook." The absence of the internal prolongation of the astragalus in *Bathmodon*, is due to the presence of a facet for articulation with some bone, which is not found in *Coryphodon*. This may have been a proximal prolongation of the entocuneiform, or perhaps a distinct bone, or even the proximal extremity of the metacarpus of the hallux.

Besides the *B. radians*, I am acquainted with a second species of superior dimensions. The remains consist of a pelvis with femur and several bones of the posterior leg and foot, and the humerus and radius of the foreleg. These bones are as long as those of the largest known *Coryphodon* (*C. anax*), and are more robust. In description of this new species, which I call *Bathmodon pachypus*, I give the following dimensions :—

[1] Annual Report U. S. Geolog. Survey Terrs., 1872, p. 588.

[2] Report U. S. G. Survey W. of the 100th Meridian, iv, 1877, p. 187.

[3] American Naturalist, Jan. 1882, Proceeds. Amer. Philos. Society, 1881, p. 165.

		M.
Length of humerus,		·400
Diameters of proximal extremity	anteroposterior,	·107
	transverse oblique,	·159
Width at epicondyles,		·166
Diameters of condyles	transverse,	·112
	anteroposterior roller,	·058
	anteroposterior flange,	·087
Length of pelvis antero-posteriorly,		·600
Chord of crest of ilium,		·350
Anteroposterior width of peduncle ilium,		·110
Length of ischium from acetabulum,		·150
Length of pubis to symphysis do.,		·160
Length of femur,		·527
Width of femur proximately,		·160
Diameter of head of femur,		·080
Diameter of shaft above third trochanter,		·066
Diameter of shaft at third trochanter,		·106
Width of condyles of femur,		·134
Depth of condyles with rotular crest,		·126
Diameters of astragalus above	anteroposterior,	·0675
	transverse,	·0800
Length of calcaneum,		·100

From the Wasatch of the Big Horn, J. L. Wortman.

Uintatherium robustum Leidy.

I have for some years had in my possession a fragmentary lower jaw from the Bridger beds of Wyoming, which I have been unable to refer to its proper place in the system. It is described in part in the Annual Report of the U. S. Geological Survey of the Territories, 1872, p. 565. The rami support roots and crowns of six molars, and the symphysis has two alveoli on each side. The peculiarity of the animal consists in this latter fact, since the species so far as described, are said to have four teeth on each side of the symphysis, viz., three incisors and one canine. Those present in the present species I suppose to be incisors. The molar teeth are so much like those of *Uintatherium robustum*, that I believe the specimen to belong to that species.

Symphysis very much compressed, so that the incisor teeth of opposite sides are close together; its inferior outline curved

upwards to the alveolar edge, in an obtuse keel. Base of flange for superior canine distinct, commencing below the posterior edge of the posterior alveolus, and immediately preceded by a mental foramen. Middle line of symphysis rugose. Ramus at last molar robust, owing to the prominence of the inferior part of the anterior masseteric ridge. In connection with the oblique position of the head, the inferior molars are oblique to the long axis of the ramus, sloping upwards and backwards, with exposed anterior roots. The molars increase in size posteriorly, and the last one is abruptly larger than the penultimate. Their structure is as in *U. robustum*, *i. e.*, with an obliquely transverse high crest in front, and a low posterior transverse edge of the heel, and a short oblique crest between the two. The last named is short, and is directed obliquely outwards and forwards towards the external extremity of the anterior crest, but disappears before reaching it. The internal extremity of this and of the low posterior crest, with the external extremity of the anterior crest, rise into cusps. At the middle of the anterior base of the anterior transverse crest there is a tubercle, which represents the anterior limb of the anterior V in *Coryphodon*. The crowns of the premolars are broken away in the specimen.

The alveoli of the incisors are flat, and are directed forwards at an angle of only 20° from the horizontal until near their orifices, where the angle is greater. The roots of the incisors are thus curved upwards and forwards. There is but little space between the anterior alveolus and the anterior angle of the symphysis.

Measurements.		M.
Length from anterior edge of symphysis to anterior base of canine flange,		·074
Width of symphysis below at bases of lateral flanges,		·032
Depth of symphysis between do.,		·040
Width of symphysis above between posterior incisors,		·017
Length of bases of posterior five molars,		·148
Length of bases of true molars,		·110
Diameters crown, m. ii,	anteroposterior,	·031
	transverse in front,	·020
Diameters crown, m. iii,	anteroposterior,	·035
	transverse in front,	·025
Width of ramus at posterior edge of m. iii,		·040

Although the crowns are somewhat worn, the enamel is wrinkled intermediately between coarse and fine.

The specimen described was obtained in the Bridger beds on Henry's Fork of Green River, Wyoming.

Triisodon conidens Cope.

A right maxillary bone and corresponding mandibular ramus represent this species in my collection. The former sustains the last five molars, and the latter the last three, with alveoli of the others and of the canine tooth. The pieces indicate a skull of the size of that of the wolf, and a good deal more robust in its vertical measurements.

The third superior premolar has a base of triangular outline, the external side longer than either of the internal, which are connected by a broadly rounded angle. The external cusp is of lenticular section at the base, and circular section near the apex. An internal cusp is represented by a strong cingulum as in *Periptychus*, which connects with the posterior base of the external cusp. The crown of the fourth superior premolar has a triangular base of which the anterior side is shorter than either of the other two, which are subequal. The external cusp is large, simple, and subconic. The internal is distinct but smaller and is continued posteriorly as a cingulum to the posterior base of the external cusp. No internal cingulum. The crown of the first true molar is worn to the roots. The second true molar is the longest of the series. Its base is a triangle, placed transversely to the axis of the jaw, of which the external side is the shortest, the anterior the next longer, and the posterior the longest. The apex or internal extremity of the crown is obtusely rounded. There are two subequal external cusps, which are injured in the specimen. The internal cusp is the apex of a V whose limbs form the anterior and posterior edges of the grinding face of the crown, extending outwards to near the bases of the external cusps. Posterior to the posterior one is a strong basal cingulum. No internal, and a faint anterior cingulum. There is probably an external cingulum, but it is broken away. The last molar is of an oval outline placed transversely to the cranial axis, both the external and internal extremities contracted, the latter a little the more so. There is a large anterior external conical cusp. The posterior external is small, and is situated at the posterior third of the posterior border of the

crown. The internal cusp is well developed, and has a subcircular section. There are strong external and posterior cingula, and a weak anterior one, but no internal cingulum. The posterior extremity of the maxillary bone within the zygoma, is immediately above the posterior border of the last superior molar.

Measurements of Superior Molars.

		M.
Length of bases of posterior five,		·069
Diameters base, Pm. iii,	anteroposterior,	·013
	transverse,	·009
Diameters base, Pm. iv,	anteroposterior,	·0145
	transverse,	·014
Length base of true molars,		·039
Diameters base of m. ii,	anteroposterior,	·0175
	transverse,	·021
Diameters base, m. iii,	anteroposterior,	·010
	transverse,	·0175
Elevation of base of zygoma, above base of m. iii,		·018

The ramus of the lower jaw is, as usually with the Creodonta, deeper and less robust than that of Carnivora of corresponding size. It is also more compressed than that of the *Triïsodon quivirensis.* It retains its depth to below the canine teeth, and does not shallow below the middle of the coronoid process, where also there is no tendency to inflection. The anterior masseteric ridge is not very prominent, and the masseteric fossa is not defined below, nor is the inferior edge of the ramus prominent or ridged at that point.

The premolar teeth are lost, but they occupied but a short space, and were probably only three in number. The first and second true molars are subequal, while the third is a little smaller than either. Each consists of an anterior higher and a posterior lower portion, the lower region being at the junction of the two. The anterior part has a nearly circular section, and contracts towards the apex. The latter is divided into three cusps, a larger external and two lesser internal. The external and posterior internal soon fuse on wearing, and their combined section is a crescent. The anterior inner is small and stands near the inner edge of the crown, and not at the middle as in *T. quivirensis*, and is circular in section. The heel of the tooth rises to its posterior border, which is divided into two cusps. Each of these sends a

ridge forwards towards the base of the anterior cone of the tooth. The external is the larger, and reaches that base. The internal is smaller, and falls short of it. The posterior inferior molar differs from the others in form as well as in size. There is no posterior inner anterior cusp, the large external cusp being supplemented by a small anterior internal only, which sends a little ridge downwards and posteriorly. The heel is narrowed, and supports the two cusps on its posterior border in contact, and not separate as on the other teeth. The external is the larger, and extends forwards to the base of the anterior cone near its middle. Some remnants of hard matrix leave it uncertain whether there is a small median posterior marginal tubercle on the first and second molars or not.

The first inferior true molar has a strong external cingulum; the second has none; the third has one, which is most evident between the cusps, is weaker at the base of the posterior lobe, and faint at the anterior lobe. No internal cingula.

Measurements.

		M.
Length of true molar series,		·052
Length from m. iii to anterior masseteric ridge,		·013
Diameters of m. i,	anteroposterior,	·017
	transverse,	·0115
Diameters of m. ii,	anteroposterior,	·018
	transverse,	·011
Diameters of m. iii,	anteroposterior,	·016
	transverse,	·0105
Depth of ramus at m. iii,		·047
Width of ramus at m. iii, inferiorly,		·013

The molar teeth of this species are more like those of the *T. heilprinianus* than those of the *T. quivirensis*. This is seen in the more conic character of the anterior lobe of the tooth, and the better development of the anterior inner cusp. The species is a good deal larger than the *T. quivirensis*.

From the Puerco beds of N. W. New Mexico, D. Baldwin.

NOTE.—The superior molar teeth show a resemblance to those of *Mesonyx*, and also to those of *Deltatherium*. Among the *Mesonychidæ*, *Triïsodon* approaches *Sarcothraustes* in the form of the inferior molars, in the expanded heel. On the other hand, the

appearance of the anterior cusp of the inferior molars approaches what is seen in *Amblyctonus*. The small transverse posterior superior molar of *Triisodon* further distinguishes it from *Amblyctonus*. A series of modifications of the dental characters proceeding from the simple to the more complex, may be constructed as follows: 1. *Mesonyx;* 2. *Dissacus;* 3. *Sarcothraustes;* 4. *Triisodon;* 5. *Amblyctonus;* 6. *Deltatherium*. The first three belong to the *Mesonychidæ*, as distinguished by the form of the tarsal articulations. Whether *Triisodon* must be arranged with *Amblyctonus* or not, cannot be ascertained until the foot structure is known.

DECEMBER 19.

The President, Dr. LEIDY, in the chair.

Thirty-five persons present.

The deaths of Jos. S. Lovering, Jr., and Dr. John Forsyth Meigs, members, were announced.

On an extinct Peccary.—Prof. LEIDY said he regarded it as remarkable, that among the mulitude of remains of extinct mammals found in this country, many of which were of genera common to the old world, no well authenticated remains of Hippopotamus and of the Hog had been discovered. The representative of the latter in this country is the Peccary, of which there are two known living species, pertaining to South America, with one of them extending into Mexico and Texas. The remains of a number of extinct species have been found in the United States and territories, partly referable to *Dicotyles*, and others to a nearly allied genus, described by Dr. Le Conte under the name of *Platygonus*. In this the constituent lobes of the molar teeth are conspicuously prominent, comparatively smooth, and approximate in form those of ruminants. In *Dicotyles* they are comparatively low, wrinkled, and approximate more those of the hog.

Several fossil specimens exhibited, probably indicate an undescribed species of *Platygonus*, larger and of more robust proportions than the *P. compressus*. They have been submitted for examination by Mr. Wm. B. Henderson, who reports that they were found in clay and gravel, in a limestone quarry, in Mifflin Co., Pa. They consist of two jaw fragments with teeth, the bone being encrustated with a hard ferruginous cement of limestone and gravel. The lower jaw fragment contains the greater part of the last two molars. The jaw below the position of the first molar is thick and shallow; below the last tooth it abruptly deepens, and a short distance back is nearly double the depth. The upper jaw fragment contains the greater part of the molars and last premolar. The upper teeth exhibit a well produced basal ridge fore and aft, but none laterally, except the feeble elements of it between the lobes of the crowns.

Comparative measurements of the two fossil specimens with corresponding parts in the skull of *P. compressus* are as follows:

	P. vetus.	P. compressus.
Depth of lower jaw below first molar,	42 mm.	37 mm.
Thickness of lower jaw below first molar,	22 "	17 "
Depth of lower jaw back of last molar,	78 "	45 "
Space occupied by the last two molars,	47 "	38 "

	P. vetus.	P. compressus.
Fore and aft diameter of second molar,	21 mm.	17 mm.
Transverse diameter of second molar,	15 "	11 "
Fore and aft diameter of last molar,	28 "	21 "
Transverse diameter of last molar,	16 "	13 "
Breadth of face outside last premolars,	56 "	45 "
Breadth of face outside last molars,	68 "	52 "
Space occupied by upper molars,	62 "	50 "
Fore and aft diameter of first molar,	17 "	13 "
Transverse diameter of first molar,	16 "	12 "
Fore and aft diameter of second molar,	20 "	17 "
Transverse diameter of second molar,	18 "	14 "
Fore and aft diameter of last molar,	24 "	21 "
Transverse diameter of last molar,	19 "	14 "
Fore and aft diameter of last premolar,	12 "	11 "
Transverse diameter of last premolar,	15 "	11 "

The species may be named PLATYGONUS VETUS, though it is by no means certain that it does not pertain to one of the forms described by Prof. Marsh, from the western territories.

The following was ordered to be printed :—

AN IDENTIFICATION OF THE SPECIES OF FISHES DESCRIBED IN SHAW'S GENERAL ZOOLOGY.

BY JOSEPH SWAIN.

In the early part of the present century, Dr. George Shaw compiled a "General Zoölogy" or "Systematic Natural History," which was to contain descriptions of all the animals then known. In the two volumes on fishes,[1] he introduced a large number of new specific names, most of them arbitrary, and unwarranted alterations of prior names, the rest chiefly for species described by travelers, which had been for one reason or another left without binomial designation. Of all the various compilations of the kind, pertaining to fishes, this work of Shaw's is probably the least worthy. Some of the names, however, have priority of date. I here give a list of all the new generic and specific names introduced by Shaw, with the name which the form in question should bear, so far as I can ascertain it.

Cases involving difficulty of identification or doubt as to proper nomenclature, have been referred to Prof. Jordan, to whom I am also indebted for numerous suggestions, and for the use of his library.

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NAME.	PAGE.	IDENTIFICATION.
Anguilla vulgaris,	pl. 1, 15	Anguilla vulgaris,[2] Shaw.
Muræna romana,	26	Muræna helena, L.
Muræna africana,	30	Sidera afra (Bloch), Swain.
Muræna meleagris,	32	Sidera meleagris (Shaw), Swain.
Muræna[3] viridis,	33	? Ophichthys, sp.
Monopterus javanicus,	39	Monopterus javenensis, La Cépède.
Odontognathus abdomine aculeata,	pl. 8, 74	Odontognathus mucronatus, La Cépède.
Triurus[4] commersonii,	78	?
Genus Stylephorus,	87	Genus Stylephorus.

[1] General Zoology of Systematic Natural History, by George Shaw, M. D., F. R. S., etc., with plates from the first authorities and most select specimens. Engraved principally by Mr. Heath, London (vol. iv, 1803; vol. v, 1804).

[2] Prior to *Anguilla vulgaris* Turton (1806), and Rafinesque (1810).

[3] *Muræna viridis* is based on "*Serpens Marinus americanus*, Seb. 3, t. 70, f. 2," apparently not identifiable.

[4] Based on *Triurus bougainvillianus* La Cépède, ii, 201.

NAME	PAGE.	IDENTIFICATION.
Stylephorus cordatus,	pl. 11, 87	Stylephorus cordatus, Shaw.
Xiphias platypterus,	pl. 15, 101	Xiphias gladius, Linnæus.
Xiphias makaira, .	pl. 16, 104	Histiophorus gladius (Brouss.) La C.
Gadus[1] leverianus,	. . 153	?
Blennius trifurcatus,	. . 174	Raniceps trifurcus (Walb.), Cuv.
Cepola hermanniana,	. . 191	Tænioides hermannii,[2] La Cépède.
Gymnetrus ascanii,	pl. 27, 193	Regalecus glesne, Ascan.
Genus Vandelliüs, .	. . 199	Lepidopus (Gouan), Bl. & Schn.
Gobius ater, . . .	. . 243	Gobius ater,[3] Shaw.
Gobiomorus australis,	. . 249	Eleotris strigata (Brouss.), C. & V.
Cottus[4] australis, .	. . 263	?
Scorpæna commersonii,	. . 271	Pterois volitans (L.), C. & V.
Scorpæna bicapillata,	pl. 40, 273	Synancia bicirrata (La C.), Swain.
Scorpæna brachiata,	. . 274	Synancia verrucosa, Bloch.
Zeus opah, . .	pl. 42, 287	Lampris guttatus (Brünnich), Retzius.
Pleuronectes roseus,	pl. 43, 302	Pleuronectes flesus, L.
Pleuronectes rondeletii, .	. 307	Solea ocellata (L.), Günther.
Pleuronectes[5] argenteus, .	. 308	?
Pleuronectes diaphanus, .	. 309	Arnoglossus laterna (Walb.) Günt.
Pleuronectes tuberculatus,	. 312	Psetta maxima (L.), Swainson.
Chætodon imperialis,	pl. 41, 324	Holacanthus imperator (Bloch.), La C.
Chætodon bifasciatus,	. . 342	Heniochus macrolepidotus (L.), C. & V.
Chætodon plectorhynchus,	pl. 49, 3?6	Plectorhynchus chætodontöides, La C.
Acanthurus nasus,	pl. 51, 376	Monoceros tuberosus (La C.), Swain.
Acanthurus[6] militaris,	. . 380	Acanthurus, sp.
Acanthurus harpurus,	. . 381	Monoceros lituratus (Forst.) Swain.
Acanthurus achilles,	. . 383	Acanthurus achilles, Shaw.
Acanthurus[7] umbratus, .	. 384	?

[1] Described from a specimen in the Leverian Museum, which is "supposed" to be a native of the Southern Ocean, being placed in a collection of fishes taken during the last voyage of Captain Cook.

[2] Not *hermannianus*. as usually quoted.

[3] *Gobius ater* Shaw, is based on *Gobius niger* La C. (not of Linnæus). If this is a valid species, it seems to have been overlooked by other writers.

[4] *Cottus australis* Shaw, is "a doubtful species; described by myself in Mr. White's Voyage to Botany Bay" (Shaw).

[5] *Pleuronectes argenteus* is based on a partial description by Petiver, in "Gazoph. 10, t. 20."

[6] "Native of the Indian and American seas. In the British and Leverian Museums." (Shaw.)

[7] "Native of the Indian seas. In the British Museum." (Shaw.)

NAME.	PAGE.	IDENTIFICATION.
Acanthurus[1] meleagris, . .	385	?
Trichopus arabicus, . .	390	Thalassoma lunare (L.), Swain.
Trichopus satyrus, . .	391	Osphromenus goramy, La Cépède.
Trichopus pallasii, . .	392	Osphromenus trichopterus (Pall.), Günther.
Trichopus monodactylus, .	392	Monodactylus falciformis, La Cépède.
Scarus purpuratus, . .	397	Thalassoma purpuream (Forsk.), Swainson.
Scarus[2] rostratus, . . .	401	?
Sparus[3] bicinctus, . . .	418	?
Sparus brunnichii, . .	424	Sparus bogaraveo, Brünn.
Sparus commersonii, . .	428	Gerres oyena (Forsk.), Cuv. & Val.
Sparus melanotus, . . .	431	Lutjanus argentinaculatus (Forsk.), Swain.
Sparus luna, ...	433	Lutjanus chrysurus (Bloch), Vaill.
Sparus serran, ...	439	Serranus cabrilla (L.), Risso.
Sparus[4] sciurus, . pl. 64.	439	Serranus formosus (L.), J. & G.
Sparus argyropthalmus,	441	Priacanthus[5] macrophthalmus (Bloch), Swain.
Sparus[6] reticulatus, . .	447	?
Sparus zonatus, . . .	452	Thalliurus fasciatus (Thun.), Swn.
Sparus hemisphæricus, pl. 66,	554	Xyrichthys fuscus (La C.), Swain.
Sparus brachiatus, pl. 66,	456	Xyrichthys fuscus (La C.), Swain.
Sparus magnificus, . .	463	Conodon nobilis (L.), J. & G.
Sparus[7] palpebratus, . .	464	?
Sparus tranquebaricus, . .	471	Lutjanus johnii (Bloch), Vaill.
Sparus semifasciatus, . .	472	Epinephelus striatus (Bloch), Gill.
Sparus[8] trilineatus, . .	472	?
Sparus[9] cepedianus, . .	473	? Lutjanus, sp.

[1] "Native of the Indian and American seas. In the British Museum." (Shaw.)

[2] "Slightly described by Cépède from the MSS. of Commerson." (Shaw.)

[3] Based on "Sp. *bivittatus* Bloch, t. 263."

[4] *Sparus sciurus* Shaw, includes *Diabasis elegans* (C. & V.) J. & G. and *Serranus formosus* (L.) J. & G. *S. sciurus* may be considered as a synonym of *S. formosus*.

[5] Not *P. macrophthalmus* Cuv. and Val. = *P. arenatus* C. & V.

[6] Based on *Sparus capistratus* Gmelin.

[7] Based on *Perca palpebrosa* L.

[8] Based on *Anthias lineatus* Bloch, t. 326, f. 1.

[9] Based on *Lutjanus albo-aureus* La Cépède, iv, 239.

NAME.	PAGE.	IDENTIFICATION.
Sparus[1] sigillatus,	474	?
Gomphosus variegatus, pl. 69,	480	Gomphosus varius, La Cépède.
Labrus albidus,	490	Percis tetracanthus (La C.). Swain.
Labrus undulatus,	496	Julis lunaris (L.), Cuv. & Val.
Labrus ballanus, pl. 71,	498	Labrus bergylta, Ascanius.
Labrus ascanii,	512	Cynædus melops (L.), Swain.
Labrus[2] carinatus,	522	?
Labrus[3] cupreus,	527	?
Sciæna gibbosa,	539	Lutjanus gibbus, Bloch.
Holocentrus decussatus,	557	Epinephelus[4] decussatus (Shaw), Swain.
Holocentrus japonicus,	565	Epinephelus[5] ruber, Bloch.
Holocentrus testudineus,	566	Epinephelus brunneus, Bloch.
Holocentrus marginatus,	566	Epinephelus marginalis, Bloch.
Holocentrus bicolor,	568	Epinephelus albofuscus (La C.), Swain.
Bodianus zebra,	574	Bodianus bœnack, Bloch.
Bodianus lunulatus,	575	Bodianus lunaris (Forsk.), Swain.
Scomber madagascariensis, pl. 75,	590	Scombroides lysan (Forsk.), Swn.
Scomber[6] botla,	591	?
Scomber leopardus,	591	Scomberomorus guttatus (Bl. and Sch.), Swain.
Scomber maculosus,	592	Scomberomorus commersonii (La C.), Swain.
Scomber[7] nigricollis,	597	Teuthis, sp.
Gasterosteus carolinensis,	608	Trachynotus carolinus (L.), Gill.
Gasterosteus canadensis,	609	Elacate canada (L.), Gill.
Mullus indicus,	614	Upeneus indicus (Shaw), Günther.
Mullus bandi,	615	Upeneoides vittatus, Bleeker.
Mullus[8] radiatus,	618	Upeneus, sp.
Mullus aureovittatus,	618	Upeneus flavolineatus, C. & V.

[1] Based on *Lutjanus elliptico-flavus* La Cépède, iv, 240.

[2] Based on *Labrus aristatus* La Cépède, iii, 445.

[3] Based on *Johnius æneus* Bloch, vii, 135, taf. 357.

[4] Not identified. Based on *Epinephelus striatus* Bloch, not *Anathias striatus* Bloch, also an *Epinephelus*.

[5] Not identified by recent writers.

[6] Based on "*Botla Parah*. Russell's Indian Fishes, pl. 142 and var.? pl. 137."

[7] Based on *Centrogaster argentatus* Gmel., Syst. Nat., 1337.

[8] Not identified by recent writers.

NAME.	PAGE.	IDENTIFICATION.
Trigla[1] japonica. . . .	624	? Cephalacanthus, sp.
Genus Trachichthys, . .	630	Genus Trachichthys, Shaw.
Trachichthys australis, . .	630	Trachichthys australis, Shaw.

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NAME.	PAGE.	IDENTIFICATION.
Loricaria[2] accipenser, . .	36	Loricaria maculata, Bloch.
Loricaria dentata, . . .	37	Loricaria cataphracta, L.
Loricaria flava, . . .	38	Hypostomus plecostomus(L.),C&V.
Salmo[3] phinoc, . . .	54	? Salmo trutta, L.
Salmo salmulus, . . .	55	Salmo salar, L.
Salmo fulvus, ...	80	Sarcodaces odoë (Bloch), Günther.
Salmo rostratus, . . .	86	Coregonus oxyrhynchus, L.
Esox barracauda, . . .	105	Sphyræna picuda, Bl. & Sch.
Esox cepedianus, . pl. 110,	117	Lepidosteus tristæchus (Bl. & Sch.), J. & G.
Esox leverianus, . . .	118	Lepidosteus tristæchus (Bl. & Sch.), J. & G.
Esox stomias, . . .	120	Chauliodus sloanii, Bl. & Sch.
Polypterus niloticus, pl. 112,	122	Polypterus bichir, Geoffroy.
Mullus[4] malabaricus, . .	137	? Mugil, sp.
Polynemus niloticus, . .	151	Polynemus plebejus, Gmel.
Polynemus indicus, . . .	155	Polynemus indicus, Shaw.
Polynemus tetradactylus, .	155	Polynemus tetradactylus, Shaw.
Polynemus commersonii, . .	156	Polynemus plebejus, Gmel.
Clupea gigantea, . . .	173	Megalops cyprinoides (Brouss.), Bleeker.
Cyprinus[5] rondeletii, pl. 123,	194	Cyprinus carpio, L.
Cyprinus[6] pomeranicus, . .	202	?
Cyprinus[7] ferrugineus, pl. 131,	218	Cyprinus carpio, L.
Cyprinus punctatus, . .	220	Abramis bipunctatus (Bloch), Gün.
Cyprinus serta, . . .	232	Abramis vimba (L.), C. & V.
Cyprinus lancastriensis, . .	234	Squalius leuciscus (L.), Heckel.
Petromyzon plumbeus, . .	263	Petromyzon branchialis, L.

[1] Based on *Trigla alata*, Gmel. Syst. Nat., 1346.

[2] *Loricaria accipenser* Shaw, includes *Loricaria maculata* Bloch, and *Loricaria cataphracta* L.

[3] Based on "White Salmon, Penn., Brit. Zool."

[4] Based on "*Peddarki Sovero* Russ. pisc., t 182."

[5] Apparently a monstrosity; based on "Rondel. aquat. 2, p. 155."

[6] Based on "*Cyprinus buggenhagii* Bloch, t. 95."

[7] Apparently a monstrosity; based on "Cyprin rouge-brun, Cépède, 6, p. 490."

NAME.	PAGE.	IDENTIFICATION.
Petromyzon bicolor,	. . 263	Petromyzon branchialis, L.
Raja chagrinea,	. . . 281	Raja fullonica, L.
Raja fasciata,	. pl. 143, 286	Myliobatis nieuhofii (Bl. & Sch.), C. & V.
Raja poecilura,	. . . 291	Pteroplatea micrura (Bl. & Sch.), Müll. & Henle.
Raja[1] diabolus,	. . . 291	? Dicerobatis giornæ (La C.), Günth.
Raja[2] maculata,	. . . 316	?
Raja[3] bicolor, .	. . . 316	?
Raja thouiniana,	. pl. 147, 318	Rhinobatus thouinianus (Shaw), Swain.
Raja cuvieri, .	. . . 319	Raja clavata, L.
Squalus philippinus,	. . 341	Cestracion philippi (Bl. & Schn.), Cuvier.
Squalus[4] denticulatus,	. . 351	?
Squalus zebra, .	. . . 352	Stegostoma tigrinum (L.), Günther.
Squalus semisagittatus,	. . 361	Pristis cuspidatus, Latham.
Genus Spatularia, .	. . 362	Genus Polyodon, La Cépède.
Spatularia reticulata,	pl. 156, 362	Polyodon spathula (Walb.), J. & G.
Chimæra borealis,	pl. 157, 365	Chimæra monstrosa, L.
Chimæra australis,	pl. 158, 368	Callorhynchus australis (Shaw), Owen.
Lophius europæus,	pl. 161, 379	Lophius piscatorius, L.
Lophius cornubicus,	. . 381	Lophius piscatorius, L.
Lophius muricatus,	pl. 162, 382	Halieutæa stellata (Walb.), C. & V.
Lophius rostratus,	pl. 163, 383	Malthe vespertilio (L.), C. & V.
Lophius[5] pictus, .	pl. 165, 386	Antennarius multiocellatus (C.&V.) Günther, var. leucosoma Bleeker.
Lophius[6] marmaratus,	pl. 165, 386	Antennarius, sp.
Cyclopterus[7] pyramidatus,	pl. 167, 390	Cyclopterus lumpus, L.
Cyclopterus pavoninus,	pl. 167, 391	Cyclopterus lumpus, L.
Cyclopterus[8] bispinosus,	. 396	? Cotylis, sp.
Cyclopterus cornubicus,	. 397	Lepadogaster gouanii, La Cépède.

[1] Based on "Eereegoodee Tenkoo, Russel ind., t. 9."

[2] Based on "Temeree Russ. ind., t. 1."

[3] Based on "Nalla Temeree, Russ. ind., t. 2."

[4] Based on "Squale dentelé," La Cépède, i, 281; habitat unknown.

[5] "Pictus" is preoccupied.

[6] Not identified by recent writers; "*marmoratus*" is preoccupied.

[7] Evidently a monstrosity.

[8] Based on *Cyclopterus nudus* Gmel., Syst. Nat., 1475.

NAME.		PAGE.	IDENTIFICATION.
Balistes[1] liturosus,		405	Monacanthus, sp.
Balistes sonneratii,		406	Balistes bursa, Bl. & Sch.
Balistes bicolor,	pl. 168,	407	Balistes conspicillum, Bl. & Sch.
Balistes virescens,		408	Balistes viridescens, Bl. & Sch.
Balistes fasciatus,		409	Balistes rectangulus, Bl. & Sch.
Balistes unimaculatus,		410	Balistes verrucosus, Bl. & Sch.
Balistes cinereus,		410	Balistes cinereus, Bonnat.
Balistes signatus,		416	Balistes fuscus, Bl. & Sch.
Balistes capistratus,		417	Balistes capistratus, Shaw.
Ostracion auritus,	pl. 173,	429	Aracana aurita (Shaw), Günther.
Ostracion striatus,		430	Aracana aurita (Shaw), Günther.
Diodon[2] liturosus,		436	Diodon liturosus, Shaw.
Cephalus brevis,	pl. 175,	437	Orthagoriscus mola (L.), Bl. Sch.
Cephalus varius,		439	Ranzania truncata (Retz), Nardo.
Cephalus pallasianus,		440	Orthagoriscus mola (L.), Bl. Sch.
Syngnathus foliatus,	pl. 180,	456	Phyllopteryx foliatus (Shaw), Swainson.
Pegasus draco,	pl. 182,	461	Pegasus draconis, Linnæus.

[1] Not identified by recent writers. "Native of the Indian seas: observed about the coasts of Otaheitee by Captain G. Tobin." (Shaw.)

[2] Based on *Diodon tachété* La Cépède, ii, 13.

DECEMBER 26, 1882.

The President, Dr. LEIDY, in the chair.

Seventy-nine persons present.

Irregularities of the Dental Arch, etc.—Dr. HARRISON ALLEN called attention to the irregularity of the front and lateral curves forming the dental arch, and to some points in connection with the hard palate. He defined the curve of the teeth placed in the front of the jaw and answering to the premaxillæ, and those placed at the sides, the latter, pertaining to the maxillæ, having been found by him to be in the jaws of civilized whites always asymmetrical.

The folds (rugæ) of the hard palate are subject to much variation. In the human fœtus of five centimetres in length, they are regular, six in number, and arranged across the palate as in certain of the lower animals. At birth they have already become irregular, but as to how far such irregularity might exist without indicating deformity, he believed no data had been collected. The names canine, first intermediate, first bicuspid, second intermediate, second bicuspid, etc., were proposed for these rugæ. They are further arranged not infrequently in a median and a lateral set, an arrangement which is strikingly exhibited in some Quadrumana. When this arrangement appears in the human subject it may be accepted as an instance of reversion.

It was thought that a study of these rugæ, since they have systemic value in Cheiroptera, Insectivora and Quadrumana, might be undertaken in connection with other anthropological data. A series of plaster impressions of the dental arches and rugæ of young and adult heads of the different races, would be found of interest in this connection.

The disposition of the form of the wisdom-tooth to occasionally simulate the form of the premolar was commented upon.

The following papers were ordered to be printed:—

SOME ENCLOSURES IN MUSCOVITE.

BY H. CARVILL LEWIS.

In order to gain an insight into the method of occurrence of the crystals of biotite enclosed in muscovite, examples of which occur in several localities, the writer prepared, some seven years ago, a series of cleavage plates taken from a single crystal of muscovite and biotite. These sections, arranged in order consecutively from the base of the crystal upwards, are now delineated upon the accompanying plate, and exhibit several features of interest. The specimen figured is one of a number found at an opening in partially decomposed felspathic gneiss on Baltimore avenue, West Philadelphia. The decomposition which, due to exposure to atmospheric agencies, has more or less attacked all the minerals at this place, has either partially or completely altered the enclosed biotite into a hydrous exfoliating mineral, which, bearing the same relation to unaltered biotite as margarodite does to muscovite,[1] may be known as hydro-biotite.[2] The unaltered biotite is black, the hydro-biotite brown—both substances generally appearing in the same crystal.

The enclosed crystals of biotite have frequently well-defined edges, and contrast sharply with the surrounding white muscovite.

It is of interest to observe that, so far as noticed, the crystallographic axes of both muscovite and biotite are parallel, and their prismatic planes symmetrical. Where, owing to the imperfect development of the enclosing muscovite, this relation is not immediately perceptible, it may be rendered evident by producing in each substance a strike figure (*schlag figur*), by mechanical means. If a sharp-pointed steel rod is held lightly upon a thin piece of mica, and the rod is then struck quickly with a hammer, a hole is produced in the mica, from which radiate lines of cleavage in three directions. As Reusch has shown,[3] the cleavage in biotite (hexagonal) is parallel to the sides of the hexagon, while in

[1] *v.* Proc. Acad. Nat. Sc., Phila., 1880, p. 319.

[2] Margarodite being merely a hydrated muscovite, similar to it in all optical and physical characters, except such of the latter as are due to alteration, should properly be called *hydro-muscovite.*

[3] Monatsb. d. Konigl. Acad., Berlin, 1868, p. 428; 1869, p. 84.

muscovite (orthorhombic) two of the cleavage lines are parallel to the sides of the rhomb, and the third parallel to the shorter lateral axis (brachydiagonal). The two micas have, therefore, similar strike figures, the lines of one being parallel to those of the other. In each strike figure the lines cross each other at angles of 60°. If now a strike figure is produced close to the dividing line between the two micas, it will be seen that if the biotite is unaltered the cleavage lines run continuously from the one into the other without change of direction—a proof that the crystallographic planes of the two micas also have the same direction. This fact has already been shown by Gustav Rose[1] in a specimen of biotite in muscovite from Alstead, N. H.

Since, therefore, the two micas have symmetrically arranged prismatic planes, it is probable that they have been crystallized together out of the same solution.

A close examination of the accompanying plate, exhibiting a continuous *vertical* section of the crystal, shows that while the edges of both crystals remain parallel in successive plates, the substance of the biotite is gradually absorbed or eaten away, and replaced by the encroaching muscovite as the summit of the biotite crystal is approached. In fig. 1 the nearly perfect black crystal of biotite is seen to occupy a large space within the muscovite. Fig. 2 shows a small patch of white muscovite within the black crystal, while in figs. 3 and 4 this small patch is seen to become larger and the biotite to diminish in quantity. As the muscovite increases, the biotite diminishes. In fig. 7 the biotite is confined to one corner of the crystal. It still decreases until in fig. 11 only a minute speck of biotite remains; and finally in fig. 12 the muscovite has usurped the whole field. The biotite is apparently being eaten away by the muscovite. Both formed at once, the biotite, the more unstable of the two species, has given way to the more hardy muscovite.

Of very different character are the occasional superficial markings of magnetite, which occur upon plates of muscovite from the same locality. These markings, sometimes known as "reticulated magnetite," are most abundant and may best be studied in the muscovite of Southern Chester and Delaware Counties in Penna., and of Brandywine Hundred, Delaware.

[1] Monatsb. d. Konigl. Acad. d. Wiss., Berlin, 1869, p. 339.

These well-known and often very beautiful markings form a series of branching lines, which run in three directions across the plates of mica, sometimes resembling the frost figures upon a window pane. The lines of the figures cross each other at fixed angles of 60°, and from their similarity to crystalline forms, have been hitherto regarded by mineralogists as the result of repeated twinning around a dodecahedral axis,[1] and have been correlated with the dendritic crystallizations of native gold and copper.[2] As shown, however, by the writer in 1877,[3] these markings always bear a fixed relation to the crystallographic axes of the muscovite, and are not due to an inherent property of the magnetite.

If a crystal of muscovite enclosing reticulated magnetite be dissected into a series of successive cleavage plates, it will be found that the markings throughout are confined to similar portions of the crystal and that the three directions of the lines are maintained at the same angle throughout the whole crystal. Some common cause has produced the parallelism of the lines in successive plates. On the other hand, it will be seen that there is no direct connection between any one cleavage plate and that next above or below it. One plate may be covered with markings, and the next plate entirely free from them, while the third plate will be again covered with markings, which, quite unlike the first plate in appearance and arrangement, yet form the same angles with the exterior of the crystal. Unlike the enclosed crystals of biotite, which *penetrate* the muscovite through successive plates, the reticulated magnetite is superficial, and rests upon the separate plates of muscovite in disconnected dendritic patches. The following drawing represents four successive plates of muscovite with reticulated magnetite, and shows the independence yet correlation of these markings. Lamina No. 2, which lay immediately below No. 1, is almost free from markings, while Nos. 3 and 4, cleft from the lower side of No. 2, show that the arrangement of the markings is entirely different on each lamina, although they maintain the same direction on all four. The strike figure, common to all four laminæ, is shown in the centre of the drawing. The specimen figured was obtained in Delaware, near the Pennsylvania line.

[1] J. D. Dana, System of Mineralogy, p. 150.

[2] E. S. Dana, Text book of Mineralogy, p. 93.

[3] Proc. Min. and Geol. Section, Acad. Nat. Sc., June 25, 1877.

ON THE VALUE OF THE "NEARCTIC" AS ONE OF THE PRIMARY ZOOLOGICAL REGIONS.

BY PROFESSOR ANGELO HEILPRIN.

The six zoological regions[1] laid down by Mr. Sclater, and so admirably sketched out by Mr. Wallace, have been so very generally accepted by naturalists that it may be considered as almost presumptuous for any one to attempt at this late hour a revision of the same. But yet the evidence concerning the position of at least one of these—the Nearctic—is in many respects so negative—indeed, it might be said so directly contradictory—that a reconsideration is rendered almost imperative. The question affecting the relationship of this region is thus stated by Wallace: "Whether the Nearctic region should be kept separate, or whether it should form part of the Palæarctic or of the Neotropical regions. Professor Huxley and Mr. Blyth advocate the former course; Mr. Andrew Murray (for mammalia) and Professor Newton (for birds) think the latter would be more natural. No doubt much is to be said for both views, but both cannot be right; and it will be shown in the latter part of this chapter that the Nearctic region is, on the whole, fully as well defined as the Palæarctic, by positive characters which differentiate it from both the adjacent regions."[2]

[1] Palæarctic, Ethiopian, Indian (Oriental of Wallace), Australian, Nearctic, and Neotropical (Austro-Columbian of Huxley).

[2] Geographical Distribution of Animals, vol. 1, p. 66, 1876. Professor Newton, in the article "Birds," contained in the Encyclopædia Britannica (9th ed., iii, p. 751, 1875), thus expresses his views in the present connection: "Thus, regarded simply from an ornithologist's point of view, what we call the Nearctic 'region,' seems to have no right to be considered one of the primary regions of the earth's surface, and to be of less importance than some of the subregions of the Neotropical region. * * * It is not, however, intended here to question the validity of the Nearctic region in a zoögeographical sense. If that position could be successfully disputed, it must be done on more than ornithological grounds, and a consideration of them would be out of place in this article. It is enough to mention that though the mammals would possibly lead to much the same conclusion as the birds do, yet the lower classes of vertebrates—reptiles, amphibians and fishes—would most likely have a contrary tendency, while the present writer is quite unable to guess at the result which would be afforded by the invertebrates."

In view of the very divergent positions occupied by the naturalists above cited as to the value of the region here referred to, it may be fairly conceded, we believe, and with due deference to the high authority of Mr. Wallace, that the question of position or relationship is still an open one; and the more especially can this be considered to be the case, since several of the authors do not appear to be agreed even as to the general (or preponderating) relationship of the contained mammalian fauna, or that branch of the representative fauna which is usually taken to be most characteristic (typical) of a region.[1]

In the hope, therefore, of throwing some additional light on this subject the author has been constrained to make the following critical inquiry. The points which it has been attempted to solve are:—

1. Whether the Nearctic region is entitled to be considered as an independent region by itself.

2. If not, of which region, Palæarctic or Neotropical, does it constitute a part.

The relative relationship of the Nearctic fauna with the faunas of the Palæarctic and Neotropical regions constitutes the first portion of the inquiry.[2]

The Nearctic mammalian fauna comprises, according to Wallace, about 26 families, as follows:

Phyllostomidæ,	Suidæ,
Vespertilionidæ,	Cervidæ,
Noctilionidæ,	Bovidæ,
Talpidæ,	Muridæ,
Soricidæ,	Dipodidæ,
Felidæ,	Saccomyidæ,

[1] Wallace, *op. cit.*, 1, p. 57.

[2] In the following analyses of mammalian families, genera and species, the author has followed the tables furnished by Wallace in his "Geographical Distribution of Animals," and for two reasons: 1st, The circumstance that these tables have served as the basis for Mr. Wallace's own conclusions, *et conseq.* as the guiding data for those authors who have accepted the views of this naturalist; and 2d, The difficulty of constructing new tables, which in their application to all the various zoögeographical regions, could claim a decided advantage over those that are here furnished. For the North American fauna a reconsideration based upon the more recent works of Coues and Allen, where the number of species is very materially reduced, is given later on.

Canidæ,	Castoridæ,
Mustelidæ,	Sciuridæ,
Procyonidæ,	Haploödontidæ,
Ursidæ,	Cercolabidæ,
Otariidæ,	Lagomyidæ,
Trichechidæ,	Leporidæ,
Phocidæ,	Didelphyidæ.

Of this number only one family—the *Haploödontidæ*—comprising one or two species of beaver-like animals inhabiting the west coast, can be said to be strictly peculiar to the region.[1] Of the 25 non-peculiar families, 19 are also Palæarctic, and of the remaining 6, 5 are exclusively Nearctic and Neotropical and 1 (*Noctilionidæ*, or short-eared bats) is found in the eastern hemisphere.

Comparing the Nearctic with the Neotropical fauna, we find that out of the 25 non-peculiar families 18 are also Neotropical, so that the relationship between the Palæarctic and the Nearctic on one side, and the Nearctic and Neotropical on the other, would appear to be equally great. But if we take the genera included in these 26 families (74 in all[2])

[1] The *Saccomyidæ*, or pouched rats, which are also regarded as peculiar to the Nearctic region by Wallace, can scarcely be considered such, since a fair proportion of the species (*Heteromys*, 6 sp. ? ; *Geomys* [*Geomyidæ* of some authors]) penetrate to a considerable distance within the Neotropical region. The family is more properly *characteristic* than *peculiar*.

	Number of Species.		Number of Species.
[2] Phyllostomidæ,		Soricidæ,	
Macrotus,	1	Sorex,	16
Vespertilionidæ,		Neosorex,	1
Scotophilus,	5	Blarina,	7
Vespertilio,	6	Felidæ,	
Nycticejus,	1	Felis,	5
Lasiurus,	3	Lynx,	3
Synotus,	2	Canidæ,	
Antrozous,	1	Lupus,	6
Noctilionidæ,		Vulpes,	6
Nyctinomus,	1	Mustelidæ,	
Talpidæ,		Martes,	2
Condylura,	1	Mustela,	11
Scapanus,	2	Gulo,	1
Scalops,	3	Latax,	2
Urotrichus,	1	Enhydris,	1

we find that 35 are also Palæarctic,[1] and only 21 Neotrop-

	Number of Species.		Number of Species.
Taxidea,	2	Muridæ,	
Mephitis,	6	Reithrodon,	5
Procyonidæ,		Hesperomys,	16
Procyon,	2	Neotoma,	7
Bassaris,	1	Sigmodon,	2
Ursidæ,		Arvicola,	27
Ursus,	3	Myodes,	3
Otariidæ,		Fiber,	1
Callorhinus,	1	Dipodidæ,	
Zalophus,	1	Jaculus,	1
Eumatopias,	1	Saccomyidæ,	
Trichechidæ,		Dipodomys,	5
Trichecus,	1	Perognathus,	6
Phocidæ,		Thomomys,	2
Callocephalus,	1	Geomys,	5
Pagomys,	1	Saccomys,	1
Pagophilus,	1	Castoridæ,	
Halicyon,	1	Castor,	1
Phoca,	1	Sciuridæ,	
Halichœrus,	1	Sciurus,	18
Morunga,	1	Sciuropterus,	4
Cystophora,	1	Tamias,	4
Suidæ,		Spermophilus,	15
Dicotyles,	1	Cynomys,	2
Cervidæ,		Arctomys,	4
Alces,	1	Haploödontidæ,	
Rangifer,	2	Haploödon,	2
Cervus,	6	Cercolabidæ,	
Bovidæ,		Erethizon,	2
Bison,	1	Lagomyidæ,	
Antilocapra,	1	Lagomys,	1
Aplocerus,	1	Leporidæ,	
Capra,	1	Lepus,	15
Ovibos,	1	Didelphyidæ,	
		Didelphys,	2

In Wallace's table of the Palæarctic fauna, *Thalassarctos*, the polar bear, is considered as a distinct genus apart from *Ursus*. The Nearctic *Ursidæ* would accordingly be *Ursus*, 2 species, and *Thalassarctos*, 1 species.

[1] Vespertilio, Urotrichus, Sorex, Felis, Lynx, Lupus, Vulpes, Halichœrus, Cystophora, Alces, Rangifer, Cervus, Bison, Capra,

ical.[1] Of these 21, moreover, 6 belong to the volant mammalia —the bats—a class of animals possessing special means for self-distribution.

It will thus be seen that *generically* the North American mammalian fauna is much more intimately related to the Eur-Asiatic than to the South American.

Furthermore, of the 35 genera also occurring in the Palæarctic region, 21 are found nowhere else but in that region—in other words, 21 out of 74 genera are peculiar to the combined Nearctic and Palæarctic regions.[2] On the contrary, of the 21 Neotropical

Martes,	Arvicola,
Mustela,	Myodes,
Gulo,	Castor,
Ursus,	Sciurus,
Callorhinus.	Sciuropterus,
Zalophus,	Tamias,
Trichecus,	Spermophilus,
Callocephalus,	Arctomys,
Pagomys,	Lagomys,
Pagophilus,	Lepus.
Phoca,	

[1] Macrotus, Scotophilus, Vespertilio, Nycticejus, Lasiurus, Nyctinomus, Felis, Mustela, Enhydris, Mephitis, Procyon, Bassaris, Dicotyles, Cervus, Reithrodon, Hesperomys, Fiber, Sciurus, Tamias, Lepus, Didelphys.

[2] Urotrichus, Lynx, Callorhinus, Zalophus, Trichecus, Callocephalus, Pagomys. Pagophilus, Phoca, Halichœrus, Cystophora, Alces, Rangifer, Bison. Capra, Arvicola, Myodes, Castor, Spermophilus, Arctomys, Lagomys.

Capra has an outlying representative in the Neilgherry Hills of India, and likewise one—an ibex—in the highlands of Abyssinia.

genera occurring in the Nearctic fauna, only 11 are exclusively Neotropical. In other words, only 11 out of 74 genera are peculiar to the combined Nearctic and Neotropical regions.[1] Again, the 21 Nearctic-Palæarctic genera are represented by about 69 specific forms, whereas the 11 Nearctic-Neotropical genera have only about 39 specific representatives. So that, whichever way considered, there is a great preponderance of Palæarctic, as compared to Neotropical, forms in the Nearctic fauna. As far as the evidence afforded by the mammalia is concerned, therefore, there is a much closer relationship shown to exist between the North American (Nearctic) and Eur-Asiatic (Palæarctic) faunas than between the former and the South American (Neotropical).

It is thus manifest, that if the Nearctic fauna is not a distinct one, it should be united—if judged by its mammalian fauna alone—with the Palæarctic rather than with the Neotropical. But the question still remains, is it a distinct fauna, or is it only a lateral extension of the Palæarctic?

It has already been stated that the region possesses among 26 families of mammalia only one that is strictly peculiar to it—the *Haploödontidæ.*

The Neotropical, on the other hand, has out of about 31 families, 8 that are peculiar.[2]

The Australian, of 22, likewise 8.[3]

The Ethiopian, out of 44, 9 that are peculiar.[4]

The only other regions that can compare with the Nearctic in the paucity of their peculiar families are the Palæarctic and the Oriental, the former represented by 36 families, with not a single one peculiar, and the latter likewise with 36 families, of which

[1] Macrotus,
Lasiurus,
Enhydris,
Mephitis,
Procyon,
Bassaris,
Dicotyles,
Reithrodon,
Hesperomys,
Fiber,
Didelphys.

[2] *Cebidæ, Hapalidæ, Phyllostomidæ* (one species in California), *Chinchillidæ, Caviidæ, Bradypodidæ, Dasypodidæ, Myrmecophagidæ.*

[3] *Dasyuridæ, Myrmecobiidæ, Peramelidæ, Macropodidæ, Phalangistidæ, Phascolomydæ, Ornithorhynchidæ, Echidnidæ.*

[4] *Cheiromyidæ, Centetidæ, Potamogalidæ, Chrysochloridæ, Cryptoproctidæ, Protelidæ, Hippopotamidæ, Camelopardidæ, Orycteropodidæ.*

number only 3 are peculiar.[1] But the paucity of peculiar families in the case of the Palæarctic and Oriental regions is readily explained by the circumstance that both regions are bounded along the line of their greatest development by other faunal regions, with which an exchange in forms will naturally be effected. Thus the Palæarctic region is bounded along an extent of about 140 degrees of longitude, or about 9000 miles, by the Ethiopian and Oriental regions. The proportions of bounding surface to area is perhaps still greater in the case of the Oriental region. But in the case of the Nearctic region (as recognized) we have no such bounding surface—in fact we are here limited for our exchanges to the narrow strip (Mexico, Central America) uniting the two great continents—and, therefore, on the assumption of a distinct fauna it would be doubly difficult to assign a special explanation for the very limited number of peculiar families.

While the Nearctic and Palæarctic regions are each deficient in peculiar mammalian families, yet they are eminently distinguished from their nearest faunal neighbors by certain highly characteristic families, which are only rendered *non*-peculiar by the circumstance that they are contained in both regions. Such are the

1. Talpidæ, ...	Moles.
2. Trichechidæ, ...	Walruses.
3. Castoridæ, ...	Beavers.
4. Lagomyidæ, ...	Pikas.

And if the reindeer, elks, and sheep (and goats) be considered as constituting distinct families, as is maintained by many naturalists, the

5. Rangiferidæ,
6. Alcadæ,
7. Capridæ.

In addition to these 7 families we have also the hares (*Leporidæ*) and bears (*Ursidæ*), which, though not exclusively restricted to those regions, are by their numbers and vast distribution eminently characteristic of them.

Considering the Palæarctic and Nearctic regions to constitute but a single faunal division, that division would then be eminently characterized by the possession of these 7–9 peculiar families

[1] *Tarsiidæ, Galeopithecidæ, Tupaiidæ.*

alone, and would then stand in nearly the same relation by family distinctions to the other regions as the Neotropical, Ethiopian, and Australian. The combined Nearctic and Palæarctic regions would, moreover, be further united to each other by the negative character afforded in the almost total absence of the *Quadrumana*[1] and *Edentata*, orders which are abundantly represented in all the other regions but the Australian.

If now we turn to an examination of the genera peculiar to the several zoögeographical regions, we find that out of a total of 74 represented in the Nearctic, only about 26 are restricted to that region, forming 35 per cent.

In the Palæarctic, out of 100—35 peculiar = 35 per cent.

In the Oriental, out of 118—54 peculiar = 46 per cent.

In the Australian, out of 70—45 peculiar = 64 per cent.

In the Ethiopian, out of 142—90 peculiar = 63 per cent.

In the Neotropical, out of 131—103 peculiar = 78 per cent.

We here again note a deficiency in the case of the Nearctic and Palæarctic regions—an absence of positive distinguishing characters—a condition to be explained by the fact that a very considerable number of genera are rendered non-peculiar (just as in the case of the families) by the circumstance of their being represented in both the Nearctic and Palæarctic regions. But if we consider the two regions as forming in reality but one, we would have in addition to the 26 Nearctic and the 35 Palæarctic genera already referred to, 22 additional ones to be comprised in the regions as being peculiar to it, viz.:—

Genera.	Represented by Palæarctic species.	Nearctic.
Urotrichus,	1	1
Lyncus,	9	3
Gulo,	1	1
Thalassarctos,	1	1
Zalophus,	1	1
Eumatopias,	1	1

[1] About 5 species of Quadrumana, representatives of the genera *Macacus* and *Semnopithecus*, enter within the confines of Palæarctic regions. The highest latitude in the northern hemisphere reached by this class of animals is probably the Rock of Gibraltar (Lat. 36°), inhabited by the Barbary ape (*Macacus inuus*); the genus is also represented in Japan. Three or four species of Quadrumana (*Macacus*, *Cynopithecus*) likewise occur in the islands Timor, Batchian, and Celebes, belonging to the Australian region.

Genera.	Represented by Palæarctic species.	Nearctic.
Trichechus,	1	1
Callocephalus,	3	1
Pagomys,	2	1
Pagophilus,	2	1
Phoca,	2	1
Halichœrus,	1	1
Cystophora,	2	2 (?)
Alces,	1	1
Tarandus,	1	2
Bison,	1	1
Cuniculus,	1	1
Myodes,	1	3
Castor,	1	1
Spermophilus,	10	15
Arctomys,	4	4
Lagomys,	10	1
	57	45

To which may also be added *Capra* (with 10 Palæarctic species), *Ovis* (with 10 Palæarctic and 1 Nearctic species), and *Arvicola* (with 21 Palæarctic and 27 Nearctic species), genera whose representatives but barely pass beyond the confines of the region—making 25 in all. We would thus have a total of about 86 peculiar genera out of 173 represented, a proportion that would stand intermediate between what we find to exist in the Oriental and Australian regions, and which would constitute about 50 per cent. The region would be accordingly eminently marked out by positive generic characters.

Turning now to a consideration of the species which represent the peculiar genera of each region—in other words, to the representative forms of the various faunas—we find that in the Nearctic region, as at present constituted, out of a total of about 279 species, the 26 peculiar genera comprise but 60, or only 21½ per cent. of the entire fauna.

In the Palæarctic, of 426 species, the 35 peculiar genera comprise 71 = 17 per cent.

In the Oriental, of 505 species, the 54 peculiar genera comprise 165 = 33 per cent.

In the Australian, of 243 species, the 45 peculiar genera comprise 151 = 62 per cent.

In the Ethiopian, of 525 species, the 90 peculiar genera comprise 288 = 55 per cent.

In the Neotropical, of 634 species, the 103 peculiar genera comprise 376 = 60 per cent.

So here, again, just as in the case of families and genera, the Nearctic and Palæarctic regions show a very decided deficiency, the specific types that ought to characterize a fauna being but very feebly developed. But if we unite the two regions, the negative character is developed into a positive one by the incorporation of a considerable number of species representing the 25 genera, which are held in common by the two regions. The number of species held by the Nearctic region has been stated to be about 279
And of the Palæarctic, ... 426

705
Less 30 species (as will be seen further on) held in common, 30

Total for the combined region, ... 675

Of this total of 675 species for the combined region we have :—

60 represented by the genera peculiar to the Nearctic region;
71 represented by the genera peculiar to the Palæarctic region;
153 (171—18 common = 153) represented by the 25 peculiar genera common to the two regions;

284

or a proportion of species representing the peculiar genera of 284 : 675 (42 per cent.), a ratio sufficiently large to impress upon the fauna a distinctive character.

In our estimates of the Nearctic fauna we have relied upon the tables furnished by Wallace. If instead of these, however, we avail ourselves of the later data furnished by the various papers of Coues and Allen, the result will not be materially altered. According to the lists furnished by these authorities it would appear that the Nearctic mammalian fauna has, instead of 279 species, only about 210.

Two new families,[1] and three new genera[2] (of which one is peculiar) are indicated.

Out of a total of 75 genera, 27 are peculiar, which would give a proportion (36 per cent.) very little different from that deduced from Wallace's data.

These 27 peculiar genera, again, are represented according to Coues' table by about 49 species, which, out of the total of 210, would give 23 per cent. of the entire fauna, or $1\frac{1}{2}$ per cent. over that which was found in our first estimation.

Again, uniting the Palæarctic and Nearctic regions with the new data, we find, instead of a total of 705 species, only 636

Deducting 30 species held in common, . . . 30

Total, ... 606

Of this total of 606 species for the combined regions we have:

71 species represented by the genera peculiar to the Palæarctic region;

49[3] species represented by the genera peculiar to the Nearctic region;

132 species (150[4]—18 = 132) represented by the 25 genera peculiar to the two regions;

252

or a proportion of species representing the peculiar genera of 252 : 606 = 42 per cent., or precisely the figure that was obtained from Wallace's tables.

The following species of North American mammalia are generally considered to be identical with Palæarctic forms, or, at any rate, to have such close Eur-Asiatic representatives as to be but doubtfully distinguishable from them:

Evotomys (Arvicola) rutilus,	Putorius erminea,
Myodes Obensis,	? Putorius vison,
Cuniculus torquatus,	Felis Canadensis,

[1] *Zapodidæ*, *Geomyidæ*.

[2] *Ochetodon* (*Hesperomys*, pars), *Evotomys* (*Arvicola*, pars), *Cricetodipus* (*Perognathus*, pars).

[3] Instead of the 60 before recorded, corresponding to the general reduction in the number of species.

[4] 98 Palæarctic; 52 Nearctic.

Lepus timidus,
Castor fiber,
Tamias Asiaticus,
Spermophilus empetra,
? Arctomys pruinosus,
? Urotrichus Gibbsi,
Cervus Canadensis,
Alce malchis,
Tarandus rangifer,
Gulo luscus,
? Mustela Americana,
Putorius vulgaris.
Canis occidentalis,
Vulpes vulgaris,
Ursus Americanus
(et U. horribilis?)
Phoca vitulina,
Cystophora cristata,
Callorhinus ursinus,
Zalophus Gillespii,
Trichecus rosmarus,
Pagophilus Groënlandicus,
Halichœrus sp.

And perhaps a little less certain,

Ovis montana.
Bison Americanus.

From the preceding facts it may be considered as shown, 1st, that by family, generic and specific characters, as far as the mammalia are concerned, the Nearctic and Palæarctic faunas taken collectively are more clearly defined from any or all of the other regions than either the Nearctic or Palæarctic taken individually; and 2d, that by the community of family, generic, and specific characters the Nearctic region is indisputably united to the Palæarctic, of which it only forms a lateral extension.

Evidence Afforded by the Batrachia and Reptilia.

If we now turn to the evidence afforded by the batrachians and reptiles, we will find the conclusions drawn from the study of the mammals to be strikingly confirmed.[1]

Batrachia Urodela.

The following families are enumerated in the Nearctic fauna (as usually recognized):

[1] In the following zoögeographical considerations the "Sonoran" subregion of Prof. Cope, including "parts of Nevada, New Mexico, Arizona, and Sonora in Mexico" (Bulletin U. S. National Museum, i, p. 68, 1875), is taken to represent a portion of the Neotropical region, and for reasons that will be stated further on. To this section detached from the Nearctic region will probably have to be added the peninsula of Lower California (the "Lower Californian" subregion of Cope), and portions of California and Texas.

Sirenidæ, ... Peculiar to the Nearctic.
Siren, 1 species.
Pseudobranchus, 1 sp.
Proteidæ, ... Palæarctic.
Menobranchus, 2 sp.
[Palæarctic, *Proteus.*]
Amphiumidæ, ... Peculiar to the Nearctic.
Amphiuma, 1 sp.
Muræenopsis, 1 sp.
Menopomidæ, ... Palæarctic.
Menopoma, 2 sp.
[Palæarctic, *Sieboldia.*]
Amblystomidæ, ... Palæarctic.
Amblystoma.[1]
Dicamptodon, 1 sp.
[Palæarctic, *Onichodactylus*, *Ranodon.*]
Plethodontidæ, . . . Neotropical, . . Palæarctic.
7–8 genera, with about 22 species. The genus *Spelerpes*, with about 8 species, descends beyond the Nearctic boundary into northern South America; it is also represented by a solitary species in southern Europe.
Desmognathidæ, ... Peculiar to the Nearctic.
Desmognathus, 3 sp.
Pleurodelidæ, ... Palæarctic.
Diemictylus, 2 sp.

We have here, therefore, 8 families represented, 5 of which are also Palæarctic, and only one Neotropical. The 3 families restricted to the Nearctic region are represented by only 7 species. If it be urged that the presence of these 3 peculiar, but very narrowly circumscribed families is sufficient to characterize the region in which they occur, and consequently to render it distinct, it may, for similar reasons, and with almost equal force, be urged that the eastern extremity of the Eur-Asiatic region—China, Japan—should be detached from the rest of the Palæarctic by virtue of its containing representatives of two equally characteristic families, the *Menopomidæ* and *Amblystomidæ*, found nowhere else in the region.

[1] About 18 species, all of which, with one or two exceptions, are found outside of the Sonoran subregion.

Batrachia Anoura.

Bufonidæ, ... Nearly cosmopolitan.
Bufo.
Engystomidæ, . . . Tropical, Old and New World.
Engystoma, 1 species.
Hylidæ, . . Essentially tropical, Old and New World.
Acris, 1 sp.
Chorophilus, 4 sp.
Hyla, about 12 species, several of which occur in the Sonoran region or along the Neotropical boundary.
Scaphiopidæ, ... Palæarctic.
Spea.
Scaphiopus.
Cystignathidæ, . . . Neotropical, . . Australian.
2 species, both in the Sonoran subregion.
Ranidæ, ... Essentially Old World.
Rana, 8 sp.

The above data will show that the anourous or tailless batrachians scarcely afford any positive indications as to the zoögeographical position of the region in which they occur. Yet in several respects there is a very decided leaning toward the Palæarctic. Thus it agrees with the Palæarctic in the paucity of its Bufonic element, the genus *Bufo*, which comprises about 80 species, having only about 4–5 Nearctic specific representatives (if we exclude the 6–7 species found in the Sonoran districts), and about an equal number in the Palæarctic region.

Again, in the case of the *Ranidæ*, an eminently Old World family of batrachians, we have, just as in the Palæarctic region, *only one* generic representative—*Rana*—which, with about 5–6 species, but barely penetrates within the Neotropical region. Of about 108 species comprised by the genus, 8–9 belong to the Nearctic fauna, and about an equal number, 10–11, to the Palæarctic.[1] In addition to this general similarity existing between the Nearctic and Palæarctic faunas as exemplified by the *Ranidæ*, we have the further one that at least one species of the genus *Rana*[2] is common to both regions; and another Palæarctic species

[1] Boulenger, "Catalogue of the Batrachia Salientia" of the British Museum, 2d ed., 1882.

[2] *Rana temporaria* (*R. sylvatica*).

has a closely related Nearctic representative.[1] On the other hand, in the peculiarly Neotropical or tropical (in general) groups of anourous batrachians the Nearctic province is remarkably deficient. Thus of the *Engystomidæ* we have but a solitary representative, *Engystoma Carolinense.* Of the *Cystignathidæ*, which comprises upwards of 130 Neotropical forms, we have only two[2] Nearctic species, and both of these are found just beyond the confines of the region—southern Florida and along the lower Rio Grande. There is a somewhat greater development of the genus *Hyla* of the *Hylidæ* than might have been looked for, but the genus, while it may have but one really good species, is at least represented by several very well marked varieties (variously considered to be distinct species) also in the Palæarctic region.

Ophidia.

The Nearctic serpents are comprised in 4 or 5 families—*Crotalidæ* (with about 19 species), *Colubridæ*, *Elapidæ*, *Boidæ*, and *Lichanuridæ.* The first of these being an essentially American and Oriental (!) group (a few species penetrating within the Palæarctic region), can scarcely carry much weight in the matter of zoögeographical classification. The *Elapidæ* and *Boidæ* (with 3 and 2 species respectively) are tropicopolitan, and their North American representatives but barely enter the Nearctic region. The two species of the genus *Charina* (*Boidæ*) are moreover found in that section of the United States—Nevada and Lower California—which in our estimation ought to be separated from the Nearctic region. This is likewise the case with the 3 species of *Lichanura* (Lower California), which constitute the family *Lichanuridæ.* The only and most important family that remains to be specially considered is that of the *Colubridæ.* Of this cosmopolitan family we have about 107 Nearctic species; of this number about 30 belong to genera almost exclusively restricted to the Sonoran and Californian regions. Of the remaining 77, a very large proportion (more than one-half) *belong to essentially Old World genera—Coluber*, *Tropidonotus* (*Eutaenia*), and *Coryphodon* (*Bascanion*)—and *principally to such as have no South American* representatives, as *Coluber* and *Tropidonotus.*[3]

[1] *Rana esculenta* in *R. halecina.*

[2] *Lithodytes Ricordii* and *Epirhexis longipes.*

[3] The range of *Tropidonotus* extends to Guatemala.

Lacertilia.

The following are the lacertilian families occurring in the Nearctic region (as recognized):—

Amphisbænidæ, ... Almost cosmopolitan.
1 species in the Florida subregion.

Anniellidæ, ... Peculiar to the Nearctic?
1 sp. in California.

Scincidæ, ... Cosmopolitan.
14 species, 13 of which belong to the Old World genus Eumeces (or *Plestiodon*).

? Lacertidæ, ... Old World.
Xantusia, 1 sp. on the Pacific coast.

Zonuridæ (*Anguidæ*, *pars*), ... Old World.
Opheosaurus, 1 sp.

Teidæ, ... Essentially Neotropical.
A South American family of about 12 genera and 75 species, represented in the Nearctic region by 7 species, all of which, with one or two exceptions, are confined to the Sonoran and Californian provinces.

Gerrhonotidæ, ... Neotropical.
7 sp., confined to the Sonoran, Californian and Pacific subregions, and Western Texas.

Helodermidæ.
1 sp., confined to the Sonoran subregion.

Iguanidæ,. . . . . Neotropical.
An essentially Neotropical family, with about 50 genera and 150 species. Represented in the Nearctic region by about 40 species, *all of which, with two or three exceptions*, are confined to the Sonoran and Californian regions, or but just pass beyond the limits of these.

Anolidæ, ... Neotropical.
An essentially Neotropical family, with upwards of 70 species, and with only 1 or 2 Nearctic representatives.

Geckotidæ, ... Essentially tropical.
But sparingly represented in either the Palæarctic or Nearctic regions; the 5 Nearctic species being all restricted to the Sonoran and Lower Californian subregions, and the extremity of the peninsula of Florida.

An analysis of the above table shows two facts very distinctly: 1. That the South American (Neotropical) forms of lacertilians—*Teidæ*, *Iguanidæ*, *Anolidæ*—stop *almost immediately* on the borders of the Nearctic region, sending but an extremely limited number of representatives beyond the Sonoran subregion; and 2. The *very great paucity* of lacertilian forms in general throughout the great mass of the North American continent. Excluding the Sonoran and Californian provinces, and the immediate border-line of the region, there would appear to be in all *but about 20 species* of Nearctic saurians, *13 of which belong to the Old World* genus *Eumeces!* The most widely diffused form of North American *Eumeces*, moreover, is a Palæarctic species![1] A further relationship with the Palæarctic fauna is maintained by *Opheosaurus*, the only New World representative of the "glass snakes."

Chelonia.

The special leaning of the Nearctic fauna to that of the Old World is as clearly indicated by the chelonians as by any of the other groups of animals that have thus far been considered. Of the 7 non-marine families represented,[2] 3—*Trionychidæ*, *Malaclemmydæ*, *Cistudinidæ*—are *distinctively* Old World groups, and two of the others, *Emydidæ* and *Testudinidæ*, are essentially so. One family, the *Cinosternidæ*, is peculiar to the North American continent. The *Chelydridæ* have one generic representative in the Palæarctic region (China), if *Platysternum* be considered (as by Agassiz) to belong to that family.[3]

[1] *Eumeces fasciatus*. Japan.

[2] *Trionychidæ, Chelydridæ, Cinosternidæ, Emydidæ, Malaclemmydæ, Cistudinidæ, Testudinidæ.*

[3] Constituted the type of a distinct family, *Platysternidæ*, by Gray ("Supplement to the Catalogue of Shield Reptiles," p. 69, 1870).

Faunal characters defining the Sonoran and Lower Californian subregions of Prof. Cope as distinct from the Nearctic region proper, and as a portion of the Neotropical.

1. Of the 8 families of Nearctic (so-called) urodele batrachians, only 2 are represented in this portion of the continent—*Amblystomidæ* and *Plethodontidæ*—and each of these only by one or two species. Out of a total of about 54 species, therefore, this region has *only about 3 !*

2. More than one-half of all the Nearctic *Bufonidæ* are found in this region, " this being the headquarters of that genus [*Bufo*] in the Regnum Nearcticum."[1] Of about 20 Nearctic representatives of the *Hylidæ* we have here but 3; and likewise only one or two of the *Ranidæ*. The Sonoran and Lower Californian tailless batrachian fauna is thus shown to be distinct by both positive and negative characters from that of the Nearctic in general.

3. The serpent fauna comprises 22 genera, of which *10–11 are peculiar*.[2] 11 out of the 13 species and subspecies of Nearctic rattlesnake (*Crotalus*) are found here, and 7 of these nowhere else. *Coluber* is not represented.

4. Of about 55 species of lacertilians, about 46 belong to the Neotropical families *Iguanidæ*, *Teidæ*, and *Gerrhonotidæ*, and 4 to the tropical *Geckotidæ*. 11 out of the 20 genera represented are not found in any other portion of the Nearctic realm, or, at any rate, at no distantly removed part.[3]

5. Only 4–5 species of non-marine *Testudinata* are recorded,[4] 2 of which (*Cinosterna*) "are of Mexican type."

CONCLUSION.

In conclusion it may be briefly stated that, by the community of its mammalian, batrachian and reptilian characters, the Nearctic fauna (excluding therefrom the local faunas of the Sonoran and

[1] Cope, Bull. U. S. National Museum, i, p. 74, 1875.

[2] *Gyalopium, Chionactis, Sonora, Rhinochilus, Chilopoma, Trimorphodon, Hypsiglena, Phimothyra, Chilomeniscus, Lichanura,* and *Charina* (one species of the last passes into the adjoining "Pacific" subregion).

[3] *Heloderma, Sauromalus, Uma, Coleonyx, Verticaria, Diplodactylus, Cyclura, Dipsosaurus, Callisaurus, Uta,* and *Phyllodactylus.*

[4] Up to the time of the publication of Prof. Cope's "Check List," 1875.

Lower Californian subregions, which are Neotropical[1]) is shown to be of a distinctively Old World type, and to be indissolubly linked to the Palæarctic (of which it forms only a lateral extension).

The Palæarctic (Old World) affinities are further maintained in the land and fresh-water mollusca, and not only by a considerable number of representative (identical) specific types common to both regions, circumpolar, subboreal, and otherwise, but by the presence (and extensive development in most cases) of the characteristic genera *Physa*, *Planorbis*, *Limnæa*, *Paludina*, *Vivipara*, *Valvata*, and *Bythinella*, forms not at all, or but very sparingly, represented in the Neotropical realm.[2] The *Lepidoptera* among insects carry equally strong evidence in this direction, for, as Wallace justly remarks,[3] while the Nearctic fauna embraces a number of distinct types, and the Neotropical element is sufficiently well represented in the southern United States, "still, we must acknowledge, that if we formed our conclusions from the butterflies alone, we could hardly separate the Nearctic from the Palæarctic region."[4]

[1] It is very probable that portions of California, Texas, and Florida will have to be relegated to the Neotropical realm.

[2] The very great development of the *Strepomatidæ*, or New World melanians, in the waters of the Nearctic region, might be urged as a claim for recognizing the independence of this region. But for this reason alone an equal claim might be set up for considering the eastern and western United States as constituting two distinct realms, since this group of mollusks is pretty effectually limited in its distribution by the Mississippi River, none or but very few of the forms passing west of the river, except in the region of its upper course.

[3] Geog. Distr. of Animals, ii, p. 123.

[4] It is proposed to designate the combined Nearctic (as restricted) and Palæarctic regions as the *Triarctic*, from the limitation of its fauna to the three continents bordering on the Arctic Sea. Under this acceptation the Nearctic, as hitherto recognized, completely disappears, and the Sonoran and Lower Californian subregions (to which must also be added parts of California, Texas, and Florida) of the former Nearctic become a portion of the Neotropical realm.

THE GENESIS OF THE CRYSTALLINE IRON-ORES.

BY ALEXIS A. JULIEN.

In an age which admits its special indebtedness for material advancement to the industries connected with the manufacture of iron, and in a country in which these industries have been so vastly developed as in this, the question of the origin of that metal has long possessed, and must always retain, a high degree of interest. So far as relates to the limonites, turgites and bog-ores, the question has met with a satisfactory answer in the theory of the concentration of these ores by the percolation of organic acids, as fully presented in the writings of Bischoff, Hunt and others; especially as the process can be actually observed and studied in progress in the lakes, marshes and bogs of the present day. But the mode of genesis of the crystalline ores—hematites, magnetites, menaccanites, and their mixtures—enveloped partly in the sedimentary strata and chiefly in the still more ancient crystalline rocks of archæan age, can be only inferred from analogies. Nor can the problem be considered as solved by any or all of the numerous theories which have so far been advanced. These theories may be naturally divided into two classes, as they may refer the iron-ores, enclosed in the subterranean strata, to an extraneous or to an indigenous origin.

A. Theories of Extraneous Origin.

To begin with the former, we have

1. *Meteoric fall.* This startling theory has been suggested to account for the enormous mass of martitic specular iron-ore, claimed to be the most extensive known single deposit of iron-ore on the continent, that of the Cerro de Mercado, two miles from Durango, Mexico. "Cerro de Mercado is a mountain, one mile long, one-third of a mile wide, and from 400 to 600 feet in height. The ore-surface of the mountain aggregates over 10,000,000 square feet; but there are indications that the ore is not all above ground, and the engineer's report declares it to be an enormous aërolite, half imbedded in the level plain on which it lies." Such a view is sufficiently controverted by the mineralogical constitution of

the mass, and its structure—"immense veins of specular iron-ore standing nearly vertical."[1]

2. *Eruption as dykes.* According to this genetic view, the crystalline iron-ores have been extruded from the interior in a pasty condition, like a lava, through fissures in the superficial strata.[2] This theory has been recently further developed in reference to the banded jaspery iron-ores of Michigan, and it has been advanced that the banding and lamination of these ores are similar in character and origin to those strongly marked in rhyolytes, furnace slags, etc.[3] The mineralogical constitution and infusibility of these ores, their distinctly sedimentary lamination, etc.,[4] clearly testify to the unsoundness of these hypotheses.

3. *Sublimation into fissures.* The inconsiderable crusts of specular oxide, which have been observed in the vicinity of volcanoes, such as Vesuvius, have certainly no relation to the enormous *bedded* masses, distributed throughout the world, at a distance from volcanic centres.

B. Theories of Indigenous Origin.

The theories of this class differ in ascribing the origin of iron-ores to either chemical or mechanical agencies. Nine chemical theories have been proposed.

4. *Concentration from ferriferous rocks or lean ores*, by the solution and removal of the predominant constituent, *e. g.*, silica, by means of thermal solutions. Indeed it has been shown[5] that a concentration, in a similar way, of the ferriferous constituent, in the lower carboniferous limestone and dolomites of the Mississippi basin, through the removal of the more soluble calcium carbonate by carbonated waters, has apparently produced extensive deposits of limonite, *in loco originali.* But there is no evidence

[1] B. Silliman, Am. Jour. Sci., 1882 (iii), xxiv, 375; and J. Birkinbine, Chicago Min. Jour., 1882, ii, No. 4, p. 184.

[2] J. D. Whitney, The Metallic Wealth of the U. S., p. 433.

[3] M. E. Wadsworth, Proc. Bost. Soc. Nat. Hist., 1880, xx, 470; and Am. Jour. Sci., 1881 (iii), xxii, 403.

[4] J. D. Dana, Am. Jour. Sci., 1881 (iii), xxii, 320, 402; J. S. Newberry, Sch. of Mines Quarterly, Nov., 1880.

[5] J. P. Lesley, Report on Brown Hematite Deposits of Nittany Valley, Pa.; R. Pumpelly, Geol. Surv. Mo., Prelim. Rep. on Iron-ores, 1872, 8, *et seq.*

of the relation of any of the crystalline iron-ores, enclosed in sediments of plainly submarine origin, with any such subaërial process. Even were the theory satisfactory in regard to the pure ores, the essential question remains unanswered, viz., the genesis of the original "ferriferous rocks or lean ores" themselves.

5. *Saturation of porous strata, e. g.*, of sandstone, by infiltrating solutions carrying iron oxide.[1] This theory, however applicable to certain rock-masses rich in hydrated ferric oxides, can account neither for the concentration of the huge and pure bodies of the true ores, nor for the alternation of siliceous and ferriferous laminæ and layers in the lean ores.

6. *Infiltration into subterranean chambers and channels*, depositing pipe-ores and limonites in widened crevices and joints of the more recent limestones or other sedimentary rocks, or in cavities overlying impervious strata.[2] The lenticular form, laminated structure, intercalation of the material of the matrix, enclosure of the ore-bodies in the bedding-planes, and other facts, markedly distinguish the crystalline ores from the limonites formed by such a process.

7. *Decomposition of pyrite*, and other ferruginous minerals, enclosed in decaying schists, and transfer of the iron-oxide in solution as ferrous sulphate.[3] The precipitation of the iron-oxide has been sometimes attributed to simple oxidation, more usually to the production of ferrous carbonate, by reaction between the ferrous sulphate and the calcium carbonate of the limestone, afterwards converted into limonite by oxidation and hydration.[4] This theory has had only local application, even to the limonites, and its connection with the crystalline ores is rendered improbable by the absence of associated limestones, or, if present, of evidences of their erosion, etc.

8. *Derivation from original deep-sea deposits* of hydrous ferric oxide, or of ferrous carbonate, dehydrated by subsequent heat, and deoxidized by hydrogen.[5] By a modification of this theory, the jasper-ores have been connected with the ferruginous and mangan-

[1] Emmons, Nat. Hist. N. Y., iv, 94.

[2] F. Prime, Jr., Am. Jour. Sci., 1875 (iii), ix, 433.

[3] T. S. Hunt, Nat. Ac. Sci., Nov., 1874.

[4] G. Bischoff, Chem. and Phys. Geol., i, 236; F. Prime, Jr., *loc. cit.*; W. B. Rogers, Geol. Penn., 1868, ii, Pt. ii, 722, 729.

[5] J. P. Lesley, The Iron Master's Guide, p. 374.

iferous nodules which have been dredged from the surface-layer of the deep-sea ooze of our present ocean-bottoms.[1] All the evidence so far gathered, however, shows no correspondence between the phenomena, the ferriferous contents of the ooze consisting of irregular crusts and nodules, never continuous nor interlaminated with silica. On the other hand, there is abundant evidence that the strata associated with the crystalline iron-ores are mostly shallow-water or shore-deposits, in large part conglomeritic.

9. *Deposit from springs*, by oxidation and precipitation from solutions of ferrous carbonate, on exposure to the air at their issue.[2] Such deposits, it is admitted, are local and limited, and the theory can have no bearing on the ordinary wide-spread crystalline ores.

10. *Alteration of diffused ferric oxide*, disseminated through sediments, into ferrous carbonate, in presence of vegetable matter, and its accumulation in particular layers by processes of filtration and segregation.[3] The vague processes thus invoked to account for the accumulation of ores are not accepted as satisfactory, even for the carbonates of the coal measures, lying in definite planes. Nor do the sheets and beds of crystalline ores usually show the irregular characteristics which may be attributed to processes of segregation.

11. *Metamorphism of ancient bog-ores.* The reference of the crystalline iron-ores to this origin has been thus stated by Dr. Hunt: "I see no reason for assigning any other than a sedimentary origin to the magnetic and specular iron-ores of the crystalline schists; nor do I conceive that the conditions under which they were deposited differed essentially from those which at the present day give rise to beds of limonite and ochre."[4] Again he observes: "The organic matters reduce the peroxide of iron to a soluble protoxide, and remove it from the soil, to be afterwards deposited in the forms of iron-ochre and iron-ores, which by subsequent alteration become hard, crystalline, and insoluble."[5]

[1] W. O. Crosby, Proc. Bost. Soc. Nat. Hist., 1879, xx, 168,

[2] G. Bischoff, Chem. and Phys. Geol., i, 155-157, 166-167.

[3] W. B. Rogers, Geol. Penn., 1868, ii, Pt. ii, 737.

[4] Letter of Dr. T. S. Hunt, 1858, quoted in Lesley's Iron Master's Guide, p. 365. See also Vanuxem, Nat. Hist. N. Y., Geol., 3d District, p. 267.

[5] T. S. Hunt, Chem. and Geol. Essays, 22.

Le Conte also states: "Therefore we conclude that both *now* and *always* iron-ore is, and has been, accumulated by organic agency."[1]

Prof. J. D. Dana remarks,[2] concerning the Upper Silurian deposits: "The beds of argillaceous iron-ore * * * could not have been formed in an open sea, for clayey iron deposits do not accumulate under such circumstances. They are proof of extensive marshes, and, therefore, of land near the sea-level. The fragments of crinoids and shells found in these beds are evidence that they were, in part at least, salt-water marshes, and that the tides sometimes reached them." In reference to the Laurentian deposits, he states: "Limestone strata occurred among the alternations, and argillaceous iron-ores, though vastly more extensive. * * * The argillaceous iron-ore has become the bright hematite or magnetite, and it is banded by, or alternates with, schist and quartz, etc., which were once accompanying clay- and sand-layers."

Dr. Kitchell long ago opposed the theory of the igneous or eruptive origin of the magnetic iron-ores of New Jersey, maintaining that they "were of sedimentary origin, and had been deposited just as the gneiss and crystalline limestone had."[3] With this view Prof. Cook coincides, in the following statement: "The magnetic iron-ores of this State have originated from chemical or mechanical deposits, just as our hematites and bog iron-ores do now."[4]

In opposition to this theory, in its reference to subaërial bogs or marshes, it must be considered that the enclosing and associated strata bear universal testimony, both in their contents and the form of their superficies, to their submarine mode of deposit. On the other hand, if the bog-ore theory were applicable to these ores, every ore-bed would imply a terrestrial plane for the reception of the subaërial bog deposit, *i. e.*, for every ore-lens a corresponding elevation above the sea-level and ensuing subsidence of the entire underlying stratum. On the contrary, no evidence has been shown in the archæan strata of any subaërial surface; all appear to be submarine sediments, and that still more ancient rocky terrane which formed the coast whose débris, poor in iron,

[1] J. Le Conte, Elements of Geology, 375.

[2] J. D. Dana, Manual of Geol., p. 231 and 155.

[3] W. Kitchell, Geol. Surv. N. J., 2d Rep., 1855, 155, 229, etc.; and 3d Rep., 1856.

[4] G. H. Cook, Geol. of N. J., 1863, 61.

was deposited or strewn over the ancient Laurentian sea, and upon whose surface bog-deposits may have rested, seems to have been entirely buried up beneath later sediments. Again, the strongly marked lenticular form and laminated structure of all deposits of crystalline iron-ores—and even of the numerous smaller lenses, parallel or overlapping, which make up the large deposits—are unmistakably characteristic of marine accumulation, Neptune's own royal stamp. A bog-ore deposit is almost always irregular in outline, concretionary and cavernous in structure, and commonly characterized by concentration in pockets and groups of isolated lumps. One can rarely fancy any traces of such peculiarities in the compact symmetrical lenses which make up ordinary deposits of magnetite.

The complete dehydration and partial deoxidation of the hydrated iron-oxide of a bog-ore, necessary for its conversion into a magnetite, must have produced an enormous contraction; but of this there is rarely any evidence, such as might be expected, in the disturbance of the lamination of the ore, and of the stratification of the surrounding rock.

It is of common occurrence that a bed of crystalline iron-ore overlies a bed of limestone, in immediate contact (*e. g.*, at the Baldwin-Forsyth mine, Hull, Canada); and yet the surface of the latter is perfectly plane, presenting no trace of the pitting and erosion[1] to which so soluble a material would have been subjected by the action of the organic acids supposed to have been concerned in the concentration of the ore in a bog.

Although graphite does often occur in intermixture with the crystalline ores, its general absence seems to prove that it cannot be chiefly derived from the organic matter (1 to 36 per cent.) contained in all limonites, but rather, it may be, from the algæ and marine plants sometimes finding their growth and entombment in the sands, even of iron-oxide, in shallow water. To the deoxidation produced in the decomposition of the remains of such plants, the content of sulphur in many iron-ores may be due.

12. *The metamorphism of ancient lake-deposits* of limonite passing into hematite, corresponding to the oolitic "fossil ore" of the Clinton group of the Upper Silurian, to the "mustard seed" ore described by Sjörmalm, which is deposited near the banks of

[1] B. Von Cotta, Ore Deposits, 249, 284.

the present Swedish lakes,[1] etc. This "Lake ore" theory[2] seems to be valid for a large number of huge deposits of the crystalline ores, and also satisfactorily accounts for the abundant presence of apatite in many ore-beds. It may be fittingly applied, therefore, in explanation of the phenomena seen in those deposits which contain a notable amount of calcium phosphate; most of those which consist of hematite, or of magnetite passing into or occasionally enclosing hematite, viz., in this country those of Cerro de Mercado, of Southern Utah, of Port Henry, N. Y., etc.; and the beds of magnetite which present the botryoidal and concretionary aspect and radiated structure of limonite, *e. g.*, in Southern Utah.[3]

On the other hand, the poverty or almost entire absence of phosphorus and sulphur in certain ore-beds, and the extreme abundance of titanic acid, free alumina, garnet, olivine, etc., in others, demand some other explanation.

Two mechanical theories are yet to be considered.

13. *Violent abrasion and transport.* This theory may be best stated in the words of its author:

"That the azoic period was one of long-continued and violent action cannot be doubted, and while the deposition of the stratified beds was going on, volcanic agencies, combined with powerful currents, may have abraded and swept away portions of the erupted, ferriferous masses, re-arranging their particles and depositing them again in the depressions of the strata."[4]

This theory of Whitney was supplementary to his main theory of volcanic eruption of the ferriferous masses, rich in native iron. But to this Lesley properly objects that such secondary deposits would be conglomeritic and also contain metallic iron.

14. *Concentration and metamorphism of iron-sands.* The work of the ocean as a grand abrading agent, and in the transport of the abraded detritus, has been largely studied and described by many authors; but less attention has been paid to the action which goes on, during the shorter or longer period of transport

[1] B. Von Cotta, Ore Deposits, 461; The Geologist, 1863, 36.

[2] Dr. J. S. Newberry, "The Genesis of Our Iron Ores," Sch. of Mines Quarterly, Nov., 1880, and "On the Genesis of Crystalline Iron-Ores," Trans. N. Y. Acad. Sci., vol. ii, Oct. 23, 1882.

[3] J. S. Newberry, *loc. cit.*, 12.

[4] J. D. Whitney, Met. Wealth of the U. S., 434.

of the detritus, in sorting out the various constituents in reference to specific gravity. Almost every sheltered bay and cove afford instances, not only of local deposits peculiar as to size, *e.g.*, gravels, sands, or fine silt, but concentrated gatherings of the grains of certain minerals, whose separation has been due to the relation of their specific gravity and form to the force of the surf or of local currents. The tertiary sands which border our Atlantic coast present everywhere examples of this continuous and delicate jigging action of the ocean, in the gathering together—now of black iron-sands, either magnetic or titaniferous, now of red garnet-sands, often of the two intermingled, and, still more abundantly, deposits of pure white quartz-sand. The iron-sands become very prominent in certain localities, *e. g.*, in this country at Killingsworth, on the Connecticut shore of Long Island Sound, on the north shore of the lower St. Lawrence, on the coasts of California and the shores of Lake Huron and Lake Erie, Oregon, etc., and abroad, along the coast of Great Britain, the shores of the Baltic and Mediterranean, New Zealand, Madagascar, and Hindostan. Special attention has been given to the deposits of the lower St. Lawrence, which lie about three metres above high-water mark, and comprise layers of black iron-sand, often nearly pure, from 1·5 to 15 centimetres in thickness.

"An inspection of the iron-sands, from the various localities above mentioned, shows that they all contain, besides the ores of iron, a small proportion of red garnet, and more or less of fine siliceous sand. The latter of the two substances it is possible to remove almost entirely by careful washing of the crude ore."[1]

The frequent purity of these sands may be inferred from the following determinations by Dr. Hunt of their content of *quartz and siliceous residue:*

Rivière du Loup (in Chaudière Valley),	4·80 per cent.
Moisie,[2]	5·92 "
Quogue. Long Isd., N. Y. (quartz and red garnet), ...	17·00 "

In other parts of the world, especially where volcanic or crystalline rocks compose the coast-line, other minerals, such as olivine

[1] Dr. T. S. Hunt, Rep. Prog. Geol. Can., 1866-69, 261–269; also, Canad. Nat., 1872, vi, 79.

[2] The washed iron-sand contains 0·70 per cent. of sulphur, and 0·007 per cent. of phosphorus.

(in the Sandwich Islands), hornblende, augite, volcanic glass etc. (on the Mediterranean), often constitute the sands along the shores. Beach-sands, where non-calcareous, consist chiefly of the following minerals,[1] which are arranged in the order of their specific gravities:

	S. G.
Quartz (and chert), ...	2·5—2·8
Olivine, ...	3·3—3·5
Garnet, ...	3·1—4·3
Chromite, ...	4·3—4·6
Menaccanite, ...	4·5—5·
Magnetite, ...	5· —5·1

It is a significant fact that in the metamorphic, crystalline rocks of our continent, from Canada to Alabama, we find the same minerals concentrated also in rock-form, viz.:

Quartzite (siliceous schist, jasper, etc.): common everywhere.

Chrysolite (or dunite. Largely converted into serpentine, etc.): Canada, Michigan, North Carolina, Georgia, Alabama, etc.

Garnetite (or garnet-rock. Sometimes made up of manganese-garnet): Canada, New York, North Carolina, etc.; in close association with magnetite at Franklin and near Andover, N. J., in Grenville, Canada, etc. Doubtless in some cases the origin of this mineral (as well as of olivine), especially if crystallized, must be assigned to indigenous development in the course of metamorphism. But, at the Buckhorn Mine, Harnett County, N. C., my own examination of the section, 61 metres in height, confirms the statement of Prof. Kerr,[2] who notes the following series (from above downward):

Specular ore (11 metres).
Manganesian ore.
Slaty manganese-garnet.
Feldspathic gneiss.
Manganese-garnet.
Gneiss.

[1] In regard to pyrite, its ready decomposition has usually prevented its concentration in sands. As to hematite, its foliated texture seems to have resulted both in its wide transport and distribution, resisting concentration, and in its after conversion into hydrated peroxide.

[2] Geol. N. C., 1875, i, 222.

Here the garnet certainly occurs in ancient sedimentary layers, whose partial decomposition has saturated the ore with manganese oxide; while the small admixture of magnetite, frequently dispersed through the hematite, points to the original sediment of iron-sand.

Chromite: Massachusetts, Pennsylvania, North Carolina, etc.

Menaccanite: Canada, New York, New Jersey, Pennsylvania, etc.

Magnetite: common everywhere.

Compound varieties also occur in abundance, which correspond closely to the mixtures of the same minerals in the sands along the coast, viz.:

Magnetic quartzite (martitic and hematitic jasper-schists, etc.): common everywhere.

Magnetitic garnetite (also hematitic and *manganesian*): Buckhorn Mine, N. C.

Chromitic dunite: Canada, North Carolina, Alabama, etc.

Chrysolitic menaccanite (with magnetite): Cumberland, R. I.[1]

Chrysolitic magnetite: O'Neil Mine, Monroe, Orange County, N. Y.[2]

Garnetiferous magnetite: mines in Saratoga and Washington Counties, N. Y., etc.

Similar allied rocks occur abundantly in foreign countries: dunite and chrysolitic rocks in Europe, New Zealand, etc.; chrysolitic magnetite, at Taberg, Sweden;[3] magnetite and menaccanite, in many localities.

Garnet, together with hornblende, augite, cassiterite, apatite, etc., has been observed in admixture with the magnetites of many foreign deposits, *e. g.*, of the Thorbjörnsbo mine at Arendal, Sweden; of Traversella, in Piedmont; of Berggieshübel, in Saxony; of Schmiedeberg, in Silesia, etc. F. Wöhler relates:

"We spent a day in the large iron-mines of Langbanshytta. The gangue of the fine magnetic iron-ore is frequently brown

[1] M. E. Wadsworth, Bull. Mus. Comp. Zool., 1881, vii, 183.

[2] J. D. Dana, Am. Jour. Sci, 1881 (iii), xxii, 152.

[3] A. Sjören, Neues Jahrb. für Min., 1876, 434.

garnet, which is found in large quantities at the mouth of the mine, and often serves as flux for the reduction of the ore."[1]

As the rock-strata, associated with all these varieties, are undoubtedly of marine origin, and indicate deposition in shallow water, it is natural to infer their correspondence in origin, in many cases, with the unconsolidated shore-deposits of the present day. In a recent search through the scientific literature of the subject for any similar view, the following statement was found concerning the crystalline iron-ores of Canada, in which this theory has been, with some reserve, associated with the bog-ore theory:

"It seems possible that, in some cases, beds may have been formed by the accumulation of iron-sands, just as they are forming in the Gulf of St. Lawrence to-day, the material being derived from the disintegration of pre-existing crystalline rocks. Such beds we should expect to contain, not only magnetite, but ilmenite, and it is well known that in many cases, ores, on being pulverized, may be more or less completely separated into a magnetic portion, containing little or no titanic acid, and a non-magnetic portion consisting essentially of ilmenite. It seems, however, probable that in general their origin has been similar to that of the modern bog- and lake-ores. Deposits of magnetite, as a rule, do not continue of uniform thickness for any great distance like the enclosing rocks; and this is just what might be expected if we suppose them to have originally occurred as bog- or lake-ores, which accumulated in local hollows or depressions."[2]

The thinly laminated martitic and hematitic jasper-schists of the Huronian age, always remarkably free from both sulphur and calcium-phosphate, at once present themselves for explanation. Prof. Dana, in a criticism on other views,[3] has attributed the origin of these iron-ores to "metamorphism from original marsh-made beds." More probably, in my opinion, the conditions consisted of a shore of some quartzose rock, rich in magnetite, whose débris the waves and currents strewed over the sea-bottom, alternately with thin sheets of quartz-granules and magnetite-crystals, partially concentrating the one or the other material in numerous heaps or thicker layers. In the progress of the metamorphism and contortion

[1] F. Wöhler, Early Recollections of a Chemist, Am. Chem., 1875, vi, 131.

[2] B. J. Harrington, Geol. Surv. Canada, Rep. Prog., 1873-1874, 195.

[3] Am. Jour Sci., 1881 (iii), xxii, 402.

to which the layers were subjected, their compact and lenticular forms were further developed, the magnetic oxide was further oxidized, partially as martite, or completely as specular ore (as already suggested by Brooks, Credner, and others), and assumed, at points where the contortion and pressure became intense, the micaceous structure and brilliant lustre of micaceous iron-ore, by a process similar to that which produces "slickensides."

The concentration of nearly pure magnetite in the deposits enclosed in the Lower Laurentian strata of Canada and the Adirondacks, and of titaniferous magnetite or menaccanite in the huge ore-beds associated with the anorthosites of the Upper Laurentian in both regions, point unmistakably to mechanical separation of ferriferous sediments from different terranes: *i. e.*, in the one case from the magnetitic gnéiss, in the other from the traps and anorthosites, rich in menaccanite. An examination of thin sections of diabase from dykes cutting pure magnetites in Essex County, N. Y., showed this rock to be rich in menaccanite and a possible source of such sediments.

No concentration of titanic acid has ever been found in limonites or bog-ores. These facts seem significant of the insufficiency of any chemical theory to account for the origin of all the iron-ores.

In conclusion, it may be inferred that the mode of genesis of a bed of magnetic iron-ore may be determined with some probability by the following diagnosis.

When the ore retains structural characteristics allied to those of limonite, or encloses masses of hematite, or contains a notable amount of calcium-phosphate, a chemico-organic origin is probably indicated.

When the ore is exceptionally free from phosphorus, or is rich in titanic or chromic acid, or is closely associated or mixed with granular garnet or olivine, a mechanical origin may be inferred

The following annual reports were read and referred to the Publication Committee:—

REPORT OF THE RECORDING SECRETARY.

The Recording Secretary respectfully reports that during the year ending Nov. 30, 1882, fifteen members and six correspondents have been elected.

The Council has endeavored to recommend for election as correspondent those only who deserve such recognition of their scientific standing, or who, as collectors and contributors, may confer material benefit on the society.

Resignations of membership have been received from Ferris W. Price, T. L. Buckingham, T. Miles, H. W. Stelwagon and Henry Leffman. The name of one member-elect was ordered to be stricken from the roll in consequence of the provisions of the By-Laws not having been complied with within the prescribed time.

The deaths of twenty-one members and eleven correspondents have been announced. The names of the deceased have been recorded in the printed Proceedings, under the several dates of announcement.

Twenty-two papers have been presented for publication, as follows: Angelo Heilprin, 3; Rev. Dr. H. C. McCook, 2; Theodore D. Rand, 2; Henry S. Williams, 1; Dr. W. S. W. Ruschenberger, 1; L. T. Day, 1; Aubrey H. Smith, 1; Rafael Arango, 1; Dr. Harrison Allen, 1; J. S. Newberry, 1; Charles Mohr, 1; T. W. Eastlake, 1; R. E. C. Stearns, 1; Dr. Joseph Leidy, 1; Drs. H. C. Wood and H. F. Formad, 1; Joseph Swain, 1; H. A. Keller, 1; E. S. Reinhold, 1. These include four papers which were presented through the Mineralogical Section and published as part of its Proceedings. The paper by Drs. Wood and Formad, on Diphtheria, was withdrawn by the authors; all the others have been printed.

One hundred and fifty-two pages of the Proceedings for 1881, and two hundred and forty-eight for 1882, together with six lithographic plates, have been published.

Some of the earlier numbers of the publications having been entirely exhausted, it was found necessary to reprint 75 pages and three plates of the quarto Journal and 38 pages of the Proceedings. The Publication Committee is greatly indebted to Mr. Chas. F. Parker, who has devoted much care to the arrange-

ment of our stock of the earlier publications. Apart from frequent errors of paging and numbering of signatures, no account had been taken of stock on hand since the removal of the society to the present building, and it required one of Mr. Parker's experience in such work to determine how far sets of the first ten volumes of the Proceedings could be completed. The result has been an unusually large return from sales of back numbers and complete sets, as may be seen by reference to the report of the Treasurer. It will, however, require considerable additional outlay for reprinting, to enable the Committee to fill orders for the first series of the Proceedings. The scarcer numbers and volumes have not, of course, been sold separately.

One hundred and twenty-five copies of the Proceedings have been distributed to subscribers, and three hundred and forty to foreign and domestic exchanges. Of the latter, seventy-six have been sent by mail, and two hundred and sixty-four have been distributed by the Smithsonian Institution and its system of international agencies.

The average attendance at the weekly meetings, which have been held without interruption, has been twenty-six. Verbal communications have been made by thirty-two individuals, and the majority of them have been published in the Proceedings. So well has the interest in these meetings been sustained, that it has been found desirable to report forty-three of them, or all but nine, and these for the most part held in midsummer, for the public papers. In addition to the regular meetings of the Academy, those of the Sections have been held with the results recorded in the several reports.

The By-Laws were amended as follows :—Art. 14, Chap. V, by striking out all after the word "meetings," in the third line, and inserting "and with like approval may change the same." Art. 4, Chap. V, by adding "But Sections may admit persons not members of the Academy to be contributors under such rules and on such terms as the Section may determine, always provided, that a contributor shall not be eligible to office in a Section, or to vote on any question; and also provided that the rights and privileges of a contributor shall be restricted to attendance at the meetings of the Section, to the reading of original scientific papers and to taking part in the scientific discussions and proceedings exclusively, and that a contributor shall have no other right or privilege whatever in the Academy."

A proposition to so amend Art. 1, Chapter XI, as to prevent the loaning of type specimens from the Museum, was, on the recommendation of the Council, lost, it being the opinion of the majority that sufficient guarantee for their care and preservation already existed in the laws governing the loaning of specimens.

On April 25, Dr. Chas. Schaeffer was elected a Curator to supply the vacancy caused by the death of Dr. Kenderdine. He held the position until Oct. 31, when he resigned in consequence of a proposed continued absence from the country. As the vacancy occurred so near the end of the year, it was not deemed necessary to fill it until the casting of the annual ballot, which resulted in the election of Dr. W. S. W. Ruschenberger, together with the three Curators who had held office during the year.

The death of Mr. Wm. S. Vaux left vacant a Vice-Presidency and a Curatorship. On May 23 the Rev. Dr. Henry C. McCook was elected to the former office and Mr. Jacob Binder to the latter. Mr. Thos. A. Robinson was elected to fill the vacancy in the Council, caused by the election of Rev. Dr. McCook as Vice-President, he thereby becoming an ex-officio member of the Council.

At the meeting held May 23 a letter was read from a friend of the Academy, presenting through Mr. Jos. Jeanes the sum of one thousand dollars, to be appropriated in such manner as Mr. Jeanes might think best for the interests of the society. It having been suggested by Mr. Jeanes that the money might with advantage be made the nucleus of a Museum Fund, this disposition of the gift was ordered, and the meeting held May 30, adopted the following resolutions, placing the creation of the Fund on formal record:—

Inasmuch as the Academy has determined to appropriate towards the creation of a Museum Fund, one thousand dollars which have been received from "a friend of the Academy," whose name is withheld at his request, through the kindly hands of Mr. Jeanes:—

Resolved, That the Museum Fund thus begun be held under the provisions of the By-laws, Chap. VI, like other special funds.

That Mr. Jeanes be requested to convey to our liberal friend the thanks of the Academy for his bounty and generous token of friendliness to scientific work.

The Museum of the Academy, in some respects one of the

finest in the world, has grown almost entirely by gifts from those interested in the progress of the natural sciences. The Curators have never until now had even the smallest annual sum placed at their disposal for the purchase of desiderata, and many opportunities, therefore, of obtaining such have been lost. Several of the departments of the Museum are now so large that a comparatively small outlay will be sufficient to keep them abreast of current investigation. The value of a museum depends, not so much upon its size as upon the care taken by competent persons in the selection of the objects composing it.

Thanks to the liberality of Mr. Isaiah V. Williamson, Mr. Jos. Jeanes and the late Dr. Thomas B. Wilson, the Academy is reasonably well supplied with current scientific literature, but such fresh collections as have been studied from time to time by those connected with the society, either as members or students, have been for the most part secured by individual enterprise. It is hoped that the Museum Fund now created will be so added to as to furnish the means of procuring for the society material for original research.

At the meeting held Sept. 12, a committee, consisting of Messrs. Ruschenberger, Redfield, Tryon, McCook and Meehan, was appointed for the purpose of determining means for the extension of the building.

In harmony with a suggestion made by Dr. Horatio C. Wood, during a communication to the Academy, Oct. 10, on the source of supply of the cinchona alkaloids, a committee, consisting of Messrs. H. C. Wood, Thos. Meehan, John K. Valentine, Isaac C. Martindale and John H. Redfield, was appointed to memorialize Congress as to the importance of making suitable experiment in the cultivation of Cuprea bark within the limits of the United States.

No reports from these committees have as yet been received.

All of which is respectfully submitted,

EDW. J. NOLAN,
Recording Secretary.

REPORT OF THE CORRESPONDING SECRETARY.

In accordance with the laws of the Academy, the Corresponding Secretary submits the following report for the year ending Nov. 30, 1882.

The business for the year has consisted, for the most part, of letters from corresponding societies transmitting their publications and acknowledging the receipt of those sent by us, as well as acknowledgments from newly elected Correspondents.

The correspondence from the Academy has been the official acknowledgments and thanks of the society for donations of various kinds to the Museum, and the notification of Correspondents of their election.

In addition there is always an amount of miscellaneous correspondence, the greater part of which has been brought before the Academy for its action when needed; otherwise the letters, usually of inquiry, have been promptly answered.

During the summer the Corresponding Secretary had the opportunity of visiting the libraries of many corresponding societies, and found the exchanges in good state of completeness and as promptly received as is usual through the international exchange. Deficiencies were, however, detected in some instances and requests have since been officially received for missing parts.

During my absence the duties of the position were kindly and ably performed by Prof. Angelo Heilprin.

The summary is as follows:—

LETTERS RECEIVED.

Acknowledgments from Corresponding Societies,	46
Letters of transmission of publications,	50
Acknowledgments of election,	7
Miscellaneous,	17

LETTERS SENT.

Acknowledgments of donations to Museum,	165
Notifications of Correspondents elected,	6
Miscellaneous,	12

The donations to the Museum have been acknowledged in full to the donors, the number above indicating merely the letters sent; a more detailed account will appear in the Curators' report.

Respectfully submitted,

GEORGE H. HORN, M. D.,
Corresponding Secretary.

REPORT OF THE LIBRARIAN.

The Librarian reports that during the year ending Nov. 30, 1882, there have been 2795 additions made to the library of the Academy. This increase has been composed of 366 volumes, 2417 pamphlets and parts of periodicals, and 12 maps. The larger number consists as heretofore of instalments of journals and transactions received in exchange for the publications of the Academy from corresponding societies.

The sources from which this increase has been derived is as follows:—

Societies	1058
Editors	769
I. V. Williamson Fund	291
Authors	230
F. V. Hayden	158
Jos. Jeanes	61
Wilson Fund	50
Geo. Vaux	41
Department of the Interior	21
Department of Agriculture	13
Geological Surv. of Belgium	13
Executors of the late Dr. Robert Bridges	12
Geological Survey of India	10
Engineer Department, U.S.A.	8
Isaac Lea	8
Minister of Public Works, France	6
Treasury Department	5
War Department	4
British Museum	3
Smithsonian Institution	3
Minister of Public Works, Mexico	3
Geological Survey of New Jersey	2
Geological Survey of Canada	2
Norwegian Government	2
Trustees of Public Library, Victoria	2
Health Department, N. York	2
Rev. Dr. Syle	1
Liverpool Free Public Library	1
Geodetic Commission of the Netherlands	1
Fish Commissioners of Connecticut	1
J. A. Ryder	1
Geol. Survey of Minnesota	1
B. Westermann & Co.	1
Department of Mines, Nova Scotia	1
Department of Mines, N.S.W.	1
Asa Gray	1
U. S. Coast Survey	1
Louisiana Board of Health	1
Rev. H. C. McCook	1
Geological Survey of Pennsylvania	1
Thomas Meehan	1
Trustees of City Hospital, Boston	1
G. W. Fox	1
Mayor of Brighton	1
Australian Museum, Sydney	1
Royal College of Surgeons	1

The books and pamphlets obtained from these sources were distributed to the various departments of the library as follows:—

Journals	2124
Geology	185
General Natural History	69
Conchology	62
Mineralogy	60
Entomology	58
Botany	55
Bibliography	19
Chemistry	18
Anthropology	17
Ornithology	14
Agriculture	13

Physical Science,	12	Herpetology,	6
Voyages and Travels,	10	Encyclopedias,	5
Helminthology,	9	Education,	4
Ichthyology,	9	Geography,	3
Medicine,	8	Languages,	1
Mammalogy,	8	Miscellaneous,	18
Anatomy and Physiology,	8		

The income of the I.V. Williamson Fund has been mainly devoted during the past year to the purchase of continuations of books already subscribed for, and to the paying of bills which had accumulated in consequence of the failure of some of the ground-rents from which the fund is derived, as noticed in my last annual report. These bills have now all been paid and the entire income of the fund for the coming year will be at the disposal of the committee. With the exception of Elliott's Felidæ and Bucerotidæ, but little has been obtained from the income of the Wilson Fund, except the continuations of works subscribed for by the late Dr. Thos. B. Wilson.

The more valuable books in addition to those received from the above funds and in exchange, have been the gift of Mr. Jos. Jeanes, who, in addition to the $739.80 recorded in my last report, as having been given by him for the purchase of geological and botanical books, has placed during the past year $300 at the disposal of the Library Committee for the purchase of such miscellaneous works as were immediately desirable. The titles of works thus obtained, as well as those of all others received during the year, will be found in the appended list of additions to the library.

The Academy is also indebted to Mr. Jeanes for a gift of $300 to be used in binding journals, etc., subscribed for from the I. V. Williamson Fund.

At a meeting of the Academy held April 26, 1882, it was resolved, in accordance with the recommendation of the Council, to authorize the Library Committee to accept the proposition which had been received from Mr. Geo. W. Tryon, Jr., under date of Jan. 16, to dispose by sale of certain works in the library, which were in no sense connected with natural history, together with the duplicates which had been accumulating for years. The proposition to select, catalogue and sell these books under the supervision of the Library Committee was made on condition that one-half the net proceeds, after paying expenses, should be transferred to the Academy, and the other half to the Conchological

Section to form the nucleus of a fund for the purchase of specimens for the Museum.

The sale was authorized under the conviction that many valuable books on the Fine Arts and general literature would be of more use in collections where they would be inquired for and consulted than if they were retained as part of the library of the Academy, from the specialty of which they were so distinct. Such a disposition of these books and the accumulated duplicates as would be of greatest benefit to the library of the Academy would certainly meet with the approval of their liberal donors, chief among whom were Wm. Maclure and Dr. Thomas B. Wilson.

About 1897 volumes were thus disposed of; 1272 were works on religion, history, politics and general literature, for the most part of little interest or value; 424 were duplicates and 201 were on the fine arts, architecture, antiquities, etc. Care was taken to retain everything which could be considered as even remotely pertaining to natural history.

The proceeds of the sale amounted to $1325.14, the Academy's share of which, $662.57, was appropriated for binding. Each volume thus bound has a label placed on the inside of the cover properly crediting the fund. This amount, in addition to the sum received from Mr. Jeanes, has enabled me to have bound during the year 677 volumes, while 240 are in process of binding. It is believed that a sufficient balance will remain to provide for the binding of about 200 volumes in addition to those above noted. The binding of our periodicals had been some years in arrears, and the work now done, although it forwards the orderly arrangement of the library and adds greatly to the convenience of readers, leaves a large number of volumes still in unbound parts.

Every effort has been made as heretofore to keep our large collection of periodicals as complete as possible by purchase and exchange. Nearly all the applications made for deficiencies during the year have been answered promptly and satisfactorily.

A portrait in oil of the late Prof. S. S. Haldeman, painted by Waugh, was presented by Mrs. S. J. Haldeman Haly, and one of Dr. Thos. B. Wilson, by Uhlke, of Washington, has been obtained by subscription. The latter portrait completes the gallery of past Presidents with the exception of Dr. Robert Bridges. An effort is being made, with almost the certainty of success, to secure by

subscription a portrait of Dr. Bridges, which, it is hoped, will be hung in place early in the year. A framed life-sized crayon portrait of Prof. John Tyndall was presented by the artist, Mr. Ross.

In view of the above statements the Academy may be congratulated on the fact that the past year has been an unusually prosperous one for the library.

All of which is respectfully submitted,

EDW. J. NOLAN,

Librarian.

REPORT OF THE CURATORS.

The Curators present the following from the Curator-in-charge as their report for the year ending November 30, 1882:—

I would respectfully report, that during the year Mr. C. H. Townsend has been engaged in separating the families of Passerine birds, from the general ornithological collection, preparatory to a better arrangement of that order.

Mr. G. Howard Parker has been engaged in the arrangement of the Coleoptera.

The various collections have been carefully examined, and are in good condition.

The specimens presented to the Museum during the year have been labeled, and placed in their proper places.

Some progress has been made in labeling and arranging of specimens in the Museum.

Respectfully,

C. F. PARKER.

SUMMARY OF THE REPORT OF WM. C. HENSZEY,

TREASURER, FOR THE YEAR ENDING NOV. 30, 1882.

DR.

To Balance from last account		$ 918 71	
" Initiation fees		140 00	
" Contributions (semi-annual contributions)		1927 51	
" Life Memberships		200 00	
" Admissions to Museum		458 60	
" Sale of Guide to Museum		45 00	
" Sale of duplicate books	$ 5 00	667 57	
" One-half proceeds of sale of books	662 57		
" Sale of paper		1 05	
" Freight returned		13 75	
" Fees, Lectures on Palæontology		168 00	
" " " " Mineralogy		28 00	
" Publication Committee		1862 57	
" Interest from Mortgage Investments, Joshua T. Jeanes' Legacy		1000 00	
" Wilson Fund toward Salary of Librarian		300 00	
" By Publication Fund. Interest on Investments		508 55	
" Barton Fund. " " "		480 00	
" Life Membership Fund. " " "		100 00	
" Maintenance Fund. " " "		50 00	
" Eckfeldt Fund. " " "		69 79	
" Interest on Deposits		51 10	
			$8490 20

CR.

Salaries, Janitors, etc		$3204 96	
Freight		38 21	
Repairs		352 93	
Insurance		30 00	
Coal		418 00	
Gas		134 85	
Mounting Bird		1 50	
Printing, Stationery and Postage Stamps		126 77	
Alcohol		2 30	
Newspaper reports		92 00	
Water Rent		26 15	
Trays		49 00	
Printing and Paper	$1275 28	1305 28	
Binding same	30 00		
Plates and Engravings		197 00	
Binding		429 75	
Six Cases of Drawers		136 50	
Guides to Museum		23 00	
Books		44 15	
Trubner & Co., London		59 96	
A. Heilprin, fees from Lectures on Palæontology		168 00	
H. C. Lewis, fees from Lectures on Mineralogy		28 00	
Life Memberships, transferred to Life Membership Fund,		200 00	
Transferred to Stott Legacy Fund		2 00	
Miscellaneous		428 58	
			$7498 89
Balance, General Account			$991 31

LIFE MEMBERSHIP FUND. (For Maintenance.)

Balance per last Statement	$1100 00
Life Memberships transferred to this account	200 00
Interest on Investments	100 00
	$1400 00
Transferred to General Account	100 00
To Balance for Investment	$1300 00

BARTON FUND. (For Printing and Illustrating Publications.)

Balance per last Statement	$240 00
Interest on Investments	240 00
	$480 00
Transferred to General Account	480 00

JESSUP FUND. (For Support of Students.)

Balance per last Statement	$581 67
Interest on Investments	560 00
	$1141 67
Disbursed	430 00
Balance	$711 67

PUBLICATION FUND.

Balance per last Statement	$1408 25
Income from Investments	290 00
I. C. Martindale. Life Subscription to Proceedings	25 00
	$1723 25
Transferred to General Account	508 55
To Balance for Investment	$1214 70

MAINTENANCE FUND.

Balance per last Statement		$ 626 35
Interest on Investments		50 00
Isaac C. Martindale		6 79
Joseph Wharton		1000 00
Susan W. Logan and A. Sydney Logan, Executors J. Dickinson Logan, deceased	$500 00	
Less Collateral Inheritance Tax	25 00	
		475 00
		$2158 14
Transferred to General Account		50 00
To Balance for Investment		$2108 14

Mrs. STOTT FUND. (For Publications.)

Balance per last Statement for Investment		$2000 00
Transferred from General Account		2 00
		$2002 00
By Balance	$ 2 00	
Investment in Bond and Mortgage, 5 per cent. Interest	700 00	
		702 00
To Balance for Investment		$1300 00

ECKFELDT FUND.

Balance per last Statement for Investment	$966 86
Interest on Investments	69 79
	$1036 65
Transferred to General Account	69 79
To Balance for Investment	$966 86

I. V. WILLIAMSON LIBRARY FUND.

Balance per last Statement		$41 46
Rents collected		771 50
Ground-rents collected		1197 99
		$2010 95
For Books	$1040 81	
Subscription to Journal	3 00	
Binding	4 45	
Taxes and Repairs to Properties	429 17	
Collecting	100 54	
		1577 47
Balance		$433 48

THOMAS B. WILSON LIBRARY FUND.

Balance overdrawn as per last Statement	$113 38
For Books	340 61
For Binding	3 90
Transferred to General Account toward Salary of Librarian	300 00
	$757 89
Interest on Investments	525 00
Balance Overdrawn	$232 89

MUSEUM FUND.

Donation from Unknown Friend, per Joseph Jeanes, Esq., for Investment	$1000 00

BOOK FUND.

Balance per last Statement	$525 80
Joseph Jeanes. Donation	300 00
Thomas Meehan. For Books	12 69
	$838 49
Less cash paid for Books	498 66
Balance	$339 83

INSTRUCTION FUND.

Balance per last Statement	$35 00
Isaac C. Martindale	1 30
Frederick Gutekunst	10 00
John T. Morris	50 00
	$96 30
Less cash disbursed for purposes appertaining to the Fund	36 30
Balance	$60 00

BINDING FUND. (Donations from Joseph Jeanes, Esq.)

Joseph Jeanes. Donations	$300 00
Less cash disbursed for Binding	22 15
Balance	$277 85

REPORT OF BIOLOGICAL AND MICROSCOPICAL SECTION.

Eighteen meetings were held during the year, with an average attendance of about fifteen members.

The following were elected members:—Dr. Crozier Griffith, Dr. George A. Rex, Edward P. Starr, Wilson Mitchell.

The following became contributors:—Dr. McClurg, J. H. Fenton, Dr. R. A. Rainear, J. F. Herbert, D. S. Newhall.

The following resigned membership:—J. E. Mitchell, Dr. R. J. Levis, Dr. Guilford, Dr. Charles Turnbull.

The following members have died:—Dr. George Dixon, Dr. Robert S. Kenderdine, William S. Vaux.

During the year many valuable communications were brought before the Section, and interesting discussions kept up the usual attendance of members and visitors. Among the more valuable communications, etc., may be mentioned those by the following gentlemen:—

Mr. D. S. Holman.—An exhibition of a Projecting Microscope of peculiar design.

Dr. L. Brewer Hall.—An Eye Protector, to be used upon the draw tube of the microscope.

Mr. Balen.—An exhibition of living objects, especially specimens of *Philodina*, *Pandorina*, etc.

Mr. Mitchell McAllister.—A lecture upon the Cultivation of Hyacinths.

Mr. John Ryder.—Upon the Embryology of Fishes. Also upon a Compressorium of special design for study of the above.

Mr. George Binder.—Extended observations upon the *Antherenis*.

Mr. J. Schimmel.—Extended observations upon the *Chilodon cucullulus*.

Dr. G. A. Rex.—Lecture upon the Classification of the Myxomycetes.

Mr. Edward Potts.—Lecture upon Fresh-water Sponges, and their Classification.

Mr. Jacob Binder.—Extended observations upon the Sucking Cups upon the fresh-water beetles.

Dr. J. G. Hunt.—Upon Reproduction in the Algæ. Also upon Special Methods of Preparation and Mounting of Microscopical Objects.

Dr. Crozier Griffith.—Upon the Minute Anatomy of the Kidney, and upon the Vasa Recta Vessels of the Testicle.

Mr. Charles Perot.—Upon the Development of *Attacus*.

Dr. Alfred Reed.—Upon Vaccine Virus.

Mr. John C. Wilson.—Upon *Collomia coccinea*.

On October 16, the Mineralogical Section of the Academy, by invitation, met with this Section in the consideration of objects of interest to both.

At the Annual Meeting held the first Monday in December, the following were elected officers to serve during the year:—

Director, ...	Mr. Jacob Binder.
Vice-Director, ...	Mr. John C. Wilson.
Recorder, ...	Dr. Robert J. Hess.
Corresponding Secretary, . .	Dr. L. Ashley Faught.
Treasurer, ...	Dr. Isaac Norris, Jr.
Conservator, ...	Mr. Charles P. Perot.

Respectfully,

ROBERT J. HESS,

Recorder.

REPORT OF THE CONCHOLOGICAL SECTION.

The Recorder of the Conchological Section respectfully reports that papers by Prof. Angelo Heilprin, Rafael Arango, T. W. Eastlake and R. E. C. Stearns have been published in the Academy's Proceedings.

Since last report, two members, Wm. S. Vaux and Chas. M. Wheatley, and one correspondent, Dr. F. H. Troschel, have died.

Mr. Vaux became a member December 6, 1867, and was a frequent and liberal contributor to our Museum.

Mr. Wheatley was elected January 3, 1867. He for many years studied the Fresh-water Mollusks, and contributed freely both to our Museum and publications.

Dr. Troschel was elected a correspondent August 1, 1867. His death leaves incomplete his great work upon the Dentition of the Mollusca. Besides being the author of numerous other papers, principally upon the Anatomy of Mollusks, Dr. Troschel had for years annually reviewed the literature of Conchology for Wiegmann's "Archiv für Naturgeschichte." His death is a loss to science, especially in his own department.

Mr. Geo. W. Tryon, Jr., Conservator, reports that:—

"During the year ending December 1, 1882, fifty-two donations of recent shells and mollusks have been received, aggregating 2049 specimens of 724 species. Assisted as usual by Mr. Chas. F. Parker, these additions have all been labeled, mounted and arranged in the general collection, which now numbers 40,225 named tablets, upon which are mounted 141,641 specimens. A detailed list of the accessions for the year is annexed to this report. The most important of these are: A collection of 221 species, all new to the Museum, purchased by the Section; 61 species of Californian marine shells, including a number of rare and fine specimens, presented by Joseph Jeanes; 123 species of Tasmanian marine shells, nearly all new to our collection, presented by C. E. Beddome, of Hobart Town, Tasmania. To our generous Australian correspondents, Dr. J. C. Cox and Mr. John Brazier, we are again indebted for valuable suites of their native shells.

"The rearrangement of the Conchological Museum, commenced four years ago, is progressing. During the year, the Marginellidæ and Olividæ have been revised and largely relabeled. Some idea

of the extent and completeness of our collection may be formed from the fact that in these two families alone it includes 946 trays. The Columbellidæ and Cypræadæ are now undergoing like revision, the latter by Mr. S. R. Roberts."

There have been no changes made in the By-Laws of the Section.

The officers of the Section for 1883 are:—

Director,	W. S. W. Ruschenberger.
Vice-Director,	John Ford.
Recorder,	S. Raymond Roberts.
Secretary,	John H. Redfield.
Librarian,	Edw. J. Nolan.
Conservator,	Geo. W. Tryon, Jr.
Treasurer,	Wm. L. Mactier.

Respectfully submitted, on behalf of the Conchological Section, by

S. Raymond Roberts,
Recorder.

REPORT OF THE BOTANICAL SECTION.

The Vice-Director of the Botanical Section takes great pride in reporting, that notwithstanding the agreeable reports he has had to make in former years, he believes the prosperity of the work of the Section has been greater during this than any former one. Meetings have been held in all but the two summer months, and many valuable facts communicated, some of which have been repeated before the general meetings of the Academy, and published in its Proceedings. There are no debts of any consequence against the Section, while its Treasurer reports a balance on hand of $119.92. During the year one member has resigned, and it has lost one by death. The officers elected for the ensuing year are as follows:—

Director,	Dr. W. S. W. Ruschenberger.
Vice-Director,	Thomas Meehan.
Recorder,	F. Lamson Scribner.
Cor. Secretary, *Treasurer*,	Isaac C. Martindale.
Conservator,	J. H. Redfield.

It seems almost superfluous to repeat what has been so often said before in these reports, that the voluntary work of the mem-

bers is not equal to the task of placing the magnificent Herbarium of the Academy on the footing it is worthy of occupying, unless some competent botanist could be employed within a reasonable time. Still in the hope that the Academy may soon see its way to aid them, the members continue to do what they can; and the Section has very great pleasure in adopting the report of its Conservator, as part of its report of the work of the year.

Respectfully submitted,

THOMAS MEEHAN,
Vice-Director.

Conservator's Report.—The additions to the Herbarium of the Academy during the past year, exceed those of any year since the organization of the Section, being estimated at 3346 species, of which more than one-third were new to the collection, and adding more than 100 genera not before represented.

For a large proportion of these we are indebted to the zeal and liberality of our own members, who have evinced a laudable desire to perfect the Academy's collection, by filling its desiderata, and by improving the character of the representation of species already possessed. Special thanks are due to Messrs. Canby, Parker, Martindale, Meehan and others, for their efforts in this direction.

But we have also been favored with most liberal donations from other sources. From Dr. Gray, of the Cambridge Herbarium, we have received more than 1000 species. Among them we may specify a second collection of plants made in the Kuram Valley, Afghanistan, in 1880, by Major J. E. T. Aitcheson, and valuable accessions from China, Formosa, Japan, Australia and Tasmania; also a fine series of the polypetalous plants of our Mexican border, collected by Schaffner, Havard, Palmer and others, which, supplementing a collection of Palmer's plants from one of our own members, give us a very full representation of the plants of the Texo-Mexican region.

Baron F. von Müller, of Melbourne, Australia, has sent us, through Mr. Meehan, 284 species of Australian plants, many of them desiderata, and from Prof. Sargent, of the U. S. Forestry Commission, we have received choice herbarium specimens of some of the rarer trees and shrubs of our western regions. A more complete list of the donations for the year will be appended.

The care and labor incident to the reception of these additions have been great, and though the Conservator has received most essential assistance from Messrs. Parker, Burk, Meehan and Scribner, he has had little time left to devote to the improvement of the condition of the herbarium. Yet something has been done in this way. Provisional lists of species in the general herbarium have been completed nearly to the end of the polypetalous orders. In the North American Herbarium, the orders Ranunculaceæ, Saxifragaceæ, and a few smaller orders have been mounted by the aid of Mr. Parker, who has also contributed liberally to the filling of gaps in these orders, for this purpose placing his own collection entirely at the disposal of the Conservator.

Respectfully submitted,

JOHN H. REDFIELD,
Conservator.

REPORT OF MINERALOGICAL AND GEOLOGICAL SECTION.

The Director of the Mineralogical and Geological Section would respectfully report:—

Meetings of the Section have been held regularly through the year, with a fair attendance, but the papers read have not been as numerous as in former years. The additions to the Collection have been satisfactory.

On the evening of October 15th, by request of the members of the Microscopical and Biological Section, our Section met with them, the subject under consideration being Microscopic Mineralogy. By the courtesy of the former Section a large number of microscopes, many of them very fine instruments, were exhibited, and by means of them specimens of minerals and rocks were examined. This was the first joint meeting of Sections since the passage of the amendment to the By-laws removing the prohibition against it, and its success was beyond question.

Respectfully submitted,

THEO. D. RAND,
Director.

REPORT OF THE PROFESSOR OF INVERTEBRATE PALÆONTOLOGY.

The Professor of Invertebrate Palæontology respectfully reports that during the year 1882 a course of 36 lectures on Physiography and Invertebrate Palæontology was delivered in the class-room of the Academy (commencing Jan. 6, and terminating May 9), which course was attended by an average of about 27 listeners, largely made up of teachers, male and female, from some of the more prominent institutions of learning in the city.

The additions to the Palæontological Department of the Academy's Museum, which will be found recorded in another place, have been during the present year comparatively insignificant; but no special attempts have been made to increase the collections in this direction, since it was deemed advisable not to further burden the department until more of the old stock had been worked off through arrangement and classification. The most important contribution received (although not yet formally presented to the Academy) is that of true Nummulites from the Peninsula of Florida, the first and only representatives of that highly important group of organisms thus far discovered on the continent of North America.

The work of labeling and classifying the old collections in the Palæontological Department of the Academy has made considerable progress during the year, the determination of specimens embracing material contained in about 300 trays. The Conservator is pleased to state that almost the entire series of Tertiary fossils of the eastern United States—Eocene, Oligocene, Miocene, and so-called Pliocene—is now satisfactorily displayed and labeled, the re-determination and identification of species having been effected for upwards of 1700 trays. The collection, as it now stands, constitutes by far the most important and typical collection of tertiary invertebrate fossils in the country, and must form for some time to come the groundwork for any standard work bearing upon this section of American palæontological history.

The department of the library pertaining to Geology and Palæontology has received many valuable accessions during the year, for a considerable portion of which the Academy is again indebted to the liberality of Mr. Joseph Jeanes.

The department is also largely indebted to Mr. Chas. F. Parker, Curator-in-charge, who has kindly undertaken the mounting of specimens.

Respectfully,

ANGELO HEILPRIN,
Professor of Invertebrate Palæontology.

REPORT OF THE PROFESSOR OF MINERALOGY.

The Professor of Mineralogy respectfully reports that in addition to the usual work of classifying the collections under his charge, he has delivered during the winter and spring of 1882, a course of 28 lectures on Mineralogy.

The lectures, given under the auspices of the Committee on Instruction, began on January 5, 1882, and were given tri-weekly in the class-room of the Academy. They included an examination of the valuable collection of the Academy, and practical demonstrations of the method of determining minerals both by their external and by their chemical characters.

The mineralogical collection is gradually increasing in size and in value. In the absence of any specific fund for the purchase of new specimens, it has not been possible to add to its number of species except by exchange or through donations. Special care has been taken that where minerals are acquired by exchange or otherwise, preference should be given to species not in the collection. 300 specimens have been received through donation or exchange, 37 of which are species new to the collection. A detailed catalogue of these, with the donors, is given in the appended list, the minerals new to the collection being printed in italics. The most noteworthy addition to the collection has been the donation of Mr. J. M. Hartman of a large number of specimens. The lithological collection has also been increased by some 43 specimens. The labeling and mounting of the specimens has been performed as before by Mr. Chas. F. Parker, Curator-in-charge, whose skill in such work has greatly increased the beauty of the collection.

The attention of the friends of the Academy is again drawn to the necessity of mineralogical apparatus for the prosecution of advanced mineralogical work. The Professor of Mineralogy has been unable to properly classify the large collection of feldspars

in the Academy, for want of a suitable polarizing microscope. The work will be undertaken as soon as an instrument is obtained. The micas have been classified by the aid of an instrument made at his own expense. A reflecting goniometer is also greatly to be desired, both for class instruction and for the proper determination of many crystalline forms in the collection.

By the death of Mr. Wm. S. Vaux the Academy has lost a most liberal contributor to the mineralogical collection. Arrangements are now in progress, which it is hoped will result in transferring his very valuable collection to the custody of the Academy.

Respectfully submitted,

H. Carvill Lewis,
Professor of Mineralogy.

The election of Officers for 1883 was held, with the following result:—

President, . . .	Joseph Leidy, M. D.
Vice-Presidents, . .	Thomas Meehan,
	Rev. Henry C. McCook, D. D.
Recording Secretary, .	Edward J. Nolan, M. D.
Corresponding Secretary,	George H. Horn, M. D.
Treasurer, . . .	William C. Henszey.
Librarian, . . .	Edward J. Nolan, M. D.
Curators, . . .	Joseph Leidy, M. D.,
	Chas. F. Parker,
	Jacob Binder,
	W. S. W. Ruschenberger, M. D.
Councillors to serve three	Thomas A. Robinson,
years, . . .	Edward Potts,
	Isaac C. Martindale,
	Theodore D. Rand.
Finance Committee, .	Isaac C. Martindale,
	Clarence S. Bement,
	Aubrey H. Smith,
	S. Fisher Corlies,
	George Y. Shoemaker.

ELECTIONS DURING 1882.

MEMBERS.

January 31.—Robert B. Haines, Jr., Alfred C. Harrison, Abel F. Price, M. D., Rev. W. J. Holland, Chas. H. Hutchinson, Wilson Mitchell.

February 28.—Frank E. P. Lynde.

March 28.—John Edgar, M. D., Eugene M. Aaron, Geo. Taylor Robinson, M. D.

April 25.—Thomas Moore, M. D.

June 27.—Henry Howson.

September 26.—William M. Gray, M. D.

November 28.—F. Lynwood Garrison, Mrs. H. Carvill Lewis.

CORRESPONDENTS.

January 31.—Dr. A. Baltzer, of Zurich; Prof. Robert Collett, of Christiania.

February 28.—Prof. Robert Hartmann, of Berlin; Prof. W. Kowalevsky, of Moscow; Dr. K. Martin, of Leyden.

July 25.—Dr. Maxwell T. Masters, of London.

ADDITIONS TO THE MUSEUM.

December 1, 1881, to December 1, 1882.

Mammals.—Dr. Thomas Biddle. Mounted specimen of *Ornithorhynchus anatinus*, Australia

Dr. H. C. Eckstein, U. S. N. Skull and tusks of *Odobænus rosmarus*, Spitzbergen.

Jos. Jeanes. Mounted skeleton of domestic hog.

Dr. Joseph Leidy. *Hesperomys leucopus*, N. J.

P. Reuter. Fœtus of horse.

A. S. Sweeten. Fungus parasite on young rat.

G. & A. Ulrich. Mouse (monstrosity).

James F. Wood, through E. M. Aaron. Female human skeleton, Cooper's Pt., N. J.

W. S. Vaux. Two Indian skulls, Hamilton Co., Ohio.

Birds.—Phila. Zool. Society. *Polyborus tharus*, S. A. *Porphyria melanotus*, Australia. *Penelope pileata*. Brazil.

Dr. H. C. Eckstein. Skins of *Larus tridactylus*, *Fulmurus glacialis* and *Somateria v. nigra* with nest and three eggs, Spitzbergen.

B. H. King. *Tyrannus carolinensis*, Calhoun, Ga

Ophidians, *Reptiles* and *Fishes.*—Phila. Zool. Society. *Python moluris* (2 specimens), India.

A. A. Alexander. *Heloderma horridum*, Arizona.

Dr. Geo. W. Lawrence. Double-headed snake, Hot Springs, Ark.

T. R. Peale. *Pseudemys rugosa*. Rehoboth, Del.

C. H. Townsend. *Menopoma alleghaniense*, Pa.

Mrs. M. A. Haldeman. Beak of *Pristis*, Essequebo River, Demerara.

Dr. W. N. Whitney. *Hippocampus*, *Ostracion* and lower jaw of *Cestracion*, Japan.

Articulates.—W. Y. Heberton. *Limulus polyphemus*, Cape May Point, N. J.

Jos. Jeanes. Sixteen species crustaceans, San Diego, Cal.

Mrs. M. T Keemblé. Two cases of insects, Brazil.

Dr. Joseph Leidy. *Balanus balanoides*, Bass Rocks, Gloucester, Mass.

Dr. Joseph Wilson. Galls on cultivated grapevine.

W. N. Lockington. *Astacus nigrescens*, Cal.

Maria J. Moss. *Mantis carolina*, Washington, D. C.

Mollusks.—Arango, R. Thirteen species of land shells from Cuba.

Barber, E. A. Fourteen species of land and fresh-water shells from Colorado. *Helix strigosa*. *H. fulva*, *H. suppressa*, *H. pulchella*, *H. striatella*, *Sphærium solidulum*, *Pisidium virginicum*, *Physa heterostropha*, *Planorbis parvis*, *Limnæa caperata*, *Pupa Blandi*, *P. Rowelli*, *Vitrina Pfeifferi* and *Ancylus*.

Beddome, C. E. 123 species of Tasmanian marine shells, mostly new to the Academy's Collection, and recently described by Rev. J. E. Tenison-Woods.

Bland, Thomas. Nine species of land shells from various localities.

Brazier, John. *Voluta marmorata*, *V. punctata*, *V. Ellioti*. *V. Norrisi*, *Bulimus Rossiteri* (types), *Cypræa Bregeriana*, *C. quadrimaculata*, *C. stolida*, *C. Walkeri*, *Murex Angasi*; twenty-five species, mostly marine shells, from various localities; forty-eight species and varieties of marine shells from Australia.

Brown, J, J. Four species of marine shells from Honduras.

Bush, Mrs. A. E. *Pecten monotimeris* Con., Cal. 17 species of land, freshwater and marine shells, from various localities.

Bush, Mrs. A. E. Nine species of land and fresh-water shells from California.

Clark, T. W. B. *Martesia cuneiformis*, Chesapeake Bay, Md.

Conchological Section. 221 species of shells, all new to the collection, purchased; Glass models of *Eledone moschatus*, *Doris debilis*, *Doriopsis clavulata*, and *Flabellina janthina*.

Coulter, Prof. J. M. Two specimens of *Hippopus maculatus*.

Cox, Dr. J. C. Thirty-four species of marine shells from Australia; *Neæra latisulcata*, N. S. Wales.

Forbes, J. A. *Planorbis exacutus*, Illinois.

Ford, John. *Natica heros* and *N. duplicata*, Newport, R. I.; *Clea cochlea*, Sandwich Islands; *Cypræa helvola*, Singapore; *Cassidula rugata*, Australia; *Cypræa lurida* (abnormal); *Bulimus Binneyanus* Pfr., Peru.

Hartman, Dr. W. D. *Auricula* (sp.), Japan; *Vitrina Thomsoni* and *Neritina pulligera*, Australia; *Physa osculans*, *Helix strigosa*, from N. Mexico · *Bulimus loyaltyensis*, Loyalty Isl.

Hutton, Prof. F. W. Sixteen species (types) of marine shells from N. Zealand.

James, Jos. F. *Limax maximus*, Cincinnati, O.

Jeanes, Jos. Twenty-eight species of marine shells from California; thirty-three species of marine shells, San Diego, Cal.

Keehmlé, Mrs. M. T. Three eggs of *Bulimus ovatus*, from Brazil.

Latchford, F. R. *Vertigo ovata* Say; *Amnicola decisa* Hald., Quebec, Can.; *Unio ventricosus*, Ottawa River, Ontario.

Lawrence, Dr. Geo. W. *Goniobasis symmetrica* Hald., N. Carolina.

Leidy, Dr. Jos. Five specimens of *Solen ensis* (with animal), Atlantic City, N. J.; *Purpura lapillus*, *Littorina littorea*, Bass Rock, Gloucester Co., Mass.

Orcutt, C. R. *Pupa hordeacea*, San Diego, Cal.; six species of shells, San Diego, Cal.; *Murex trialatus*, *Acmæa patina*, *Chiton pseudodenticus*, *Physa distinguenda*, *Lymnæa Adelinæ*, *Succinea oregonensis*; five species of shells, San Diego, Cal.

Potts, Edw. *Sphærium securis*, Prime, N. J.

Ryder, J. A. Egg-cases of *Buccinum undatum*, *Limax maximus* (dissection), *Ostræa virginica* (yearling). *Ostræa edulis*.

Spinner, Hon. F. E. *Arca floridana* and *A. americana*, Florida; *Fusus carica* and var. *eliceans*, *Arca floridana*, Florida.

Streng, L. H. Nine species of fresh-water shells; *Anodonta imbricata*, *A. imbecilis*, *A. modesta*, *A. ovata*, *A. subgibbosa*, *A. Houghtonensis*, *A. Benedictii*, *Unio ventricosus* and *Succinea Higginsi*, from Michigan.

Tryon, Geo. W., Jr. Ten glass models of Mollusca; *Tremoctopus violaceus*, *Verania sicula*, *Helix pomatia* (dissected), *Clionopsis Krohnii*, *Tiedemannia neapolitana* (development), *Lophocercus viridis*, *Parmarion papillaris*, *Daadebardia rufa*, *Parmacella valenciennesi* and *Vaginulus Moreleti*; *Goniobasis virginica*, Mt. Vernon, Va.

Wetherby, Prof. A. G. Eleven species of land and fresh-water shells, N. Carolina; also *Helix alternata* (ribbed variety), *H. Sayi* (var. *chilhoweensis*), Tennessee; *Planorbis glabratus* and *Physa gyrina*, Florida; seven species of land and fresh-water shells from Miami Co., Florida.

Whitney, Dr. W. N. Six species of marine shells from Japan; ten species of marine shells from Yenoshima, Japan.

Willcox, Jos. *Cyrena carolinensis*, *Succinea ovalis* and *Helix septemvolva*, Fla.; *Unio luteolus*, Oneida Lake, N. Y.; *Unio complanatus* Sol., Ontario; *U. complanatus* Sol., Oneida Lake, N. Y., and *U. rectus* Lam., Oneida Lake, N. Y.

Echinodermata.—Jos. Jeanes. *Strongilocentrotus purpuratus*, *S. franciscanus*, *Toxopneustes semituberculatus*, *Echinarachnius excentricus*, *Centrostephanus coronatus*, *Diadema* (sp.), *Ophiura panamensis*, *Ophiothrix spiculata*, *Ophiplocus esmarki*, San Diego, Cal.

W. N. Lockington. *Echinarachnius excentricus*, *Asterias æqualis*, *Ophiura panamensis* and *Astropecten* (sp.), Cal.

Dr. W. N. Whitney. Three species of Echinoderms, Japan.
Cœlenterata, etc.—Jos. Jeanes. *Astropecten stellatus, Asterias capitata, Asterias* (sp.), *Patiria* (*Asterias*) *miniata, Scytaster* (sp.), *Stylatula elongata*, San Diego, Cal.
Miss Drysdale. *Actinia rapiformis*, Atlantic City, N. J.
Edw. Potts. *Alcyonidium ramosum* on Stones' Inlet, Atlantic City, N. J., and *Plumatella vesicularis*.
Rev. E. W. Lyle. *Hyalonema mirabilis*, Japan.
Joseph Willcox. Sponge. Florida.
Vertebrate Fossils.—Late Wm. M. Gabb. Seven species of reptiles and fishes, from the cretaceous of Kansas.
E. Florence. Tooth of *Oxyrhina*, Central Australia.
Rev. S. H. Lighthipe. Fragments of jaw of gavial, from the cretaceous marl of Burlington Co., N. J.
W. S. Vaux. Two molars of *Mastodon americanus*, Dick's Creek, Butler Co., Ohio. Three molars of *Elephas primigenius* and lower incisor of *Hippopotamus amphibius*.
Invertebrate Fossils.—Dr. H. C. Eckstein. Carboniferous Limestone, containing *Productus semistriatus* Martin, *P. horridus, Aviculopecten* and *Spirifer*, Green Harbor, Spitzbergen.
Joseph Jeanes. *Chione fluctifraga, Chione succincta, Pecten æquisulcatus, Pecten* (*Janira*) *dentata, Lucina Nuttalli, Lucina*, sp., *Scalaria*, sp.; *Acervularia Davidsoni*, Niagara Group.
Dr. I. Lea. *Panopæa americana*, miocene of Maryland; *Astræa*, miocene of Va.; Corals and bryozoan earth from the greensand, Long Branch, N. J.
Dr. Joseph Wilson. Crinoidal limestone and *Lithostrotion canadense* from the Burlington limestone, Burlington, Iowa.
Archæology.—George C. Henszey. Arrow-head, Pennsgrove, Salem Co., N. J.
Dr. Harry Skinner. Arrow-point, Fairmount Park, Phila.
Plants.—Wm. M. Canby. Section and part of trunk of *Alnus maritima* Muhl.; nine hundred and seventy-one species plants from Europe, Africa, Asia and Australia.
Thos. Meehan. Forty-two species of *Acacia*. Fruit of *Diospyros kaki* and of *Cydonia japonica*. Cones of *Pinus densiflora* and *Pinus Bungeana*, natives of Japan. Thirty-five species of Cactaceæ, from Arizona and southern California; fourteen species of miscellaneous plants from Western N. Am.
Isaac C Martindale. Ellis's North American Fungi, centuries VIII and IX; twenty-nine species of plants from Europe, Australia and N. America.
Baron Ferdinand Müller, of Melbourne, Australia. Two hundred and eighty-four selected species of Australian plants, mostly new to the Herbarium.
John Tatum, of Woodbury, N. J. Section of stem of an old and intertwined *Wistaria Sinensis*.
Hugh D. Vail. Fine specimen of *Echinocactus Wislizeni* Engelm., from vicinity of "Total Wreck" Mine, Arizona.
Dr. A. Gray, of Cambridge, Mass. A second collection (seventy-one species) of plants from Kuram Valley, Afghanistan, made by Major J. E. T. Aitcheson, of British Army, in 1880. Also nine hundred and fifteen species plants from China, Japan, Formosa, Australia, Mexico and Texas.
Charles F. Parker. Forty-three species of N. American Ranunculaceæ; also eleven species of other N. American plants, including three type specimens of Austin's new species.
George E. Davenport, Boston, Mass. Nine species of ferns collected in Unalaska, in 1881, by L. M. Turner.
Charles E. Smith. Specimens of the rare *Corema Conradii* Torr., male and female plants from Shawangunk Mts., Ulster Co., N. Y.
Aubrey H. Smith. Specimens of the same—male and female plants of spring and fall growth, from same locality, and of *Empetrum nigrum*, from Island of Mt. Desert, Maine.

S. B. Buckley, Austin, Texas. *Nymphæa ampla* D. C., from Lampaza Springs, Mexico.

J. G. Lemmon, Oakland, Cal. Cones of *Pinus Arizonica* Engelm., and of *Pinus Chihuahuana* Engelm., from Arizona.

Horace J. Smith, St. Barbara, Cal. *Casuarina quadrivalvis*, an Australian species, cultivated in California.

F. C. Bell, Phila. Photograph of some Hymenocetous Fungus, from one hundred and fifty yards depth in Miller's Colliery, Phœnix Park, Schuylkill Co., Pa.

Charles S. Sargent, Forestry Department of U. S. Census. Fifty-four species shrubs and trees mostly from Western N. America, and Cones of eight species of Conifers from Oregon.

Thomas Bland, N. Y. Specimen of "Dagger Film," prepared from the inner leaves of the Dagger Plant, or *Yucca aloifolia;* used by ladies in Jamaica for making artificial flowers, and for water-color painting.

F. L. Scribner. Six species grasses, from Washington Terr. and California.

B. D. M. Langdon, Mobile, Ala. Immature Cones of *Araucaria imbricata* Pavon, native of Chili, cultivated at Mobile.

J. M. Hutchings, Yosemite, California. Specimen of *Sarcodes sanguinea* Torr. in fruit, and of *Pterospora andromedea* Nutt, both from California.

Dr. G. W. Lawrence. Seed vessels of *Oenothera triloba* Nutt, from Hot Springs, Arkansas.

John H. Redfield. Six hundred and seventy-seven species of N. American plants, mostly from Florida, Arizona, Washington Terr., southern California, Texas, and the border provinces of Mexico.

Minerals [1]—Dr. W. D. Hartman. Aragonite, Birmingham Serpentine Quarries, Chester Co., Pa.

Dr. H. C. Eckstein. Bituminous Coal, Green Harbor, Spitzbergen.

The late Wm. M. Gabb. Native gold in magnetic sand, St. Domingo.

H. C Lewis *Phytocollite*, Scranton, Pa.; Helvite, Amelia Co., Va.

Dr. Geo. W. Lawrence. Mountain leather, Salina Co., Ark.

Rev. S. H. Lightbipe. Fuller's earth, from the marl, Pemberton, N. J.

Dr. Jos. Leidy. White Tourmaline in limestone, De Kalb, St. Lawrence Co., N. Y.; Triphylite and Amblygonite, Mt. Mica, Paris, Me.; Rubellite, by decomposition passing into Steatite, Mt Mica, Me.; Cookeite with Steatite, Mt. Mica, Paris, Me.; Tourmaline passing into Lepidolite, Tourmaline in Lepidolite, Rubellite, Decomposed Rubellite, Mt. Mica, Paris, Me.

Theo. D. Rand. *Arksutite, Hagemannite*, Ivigtut, Greenland; *Hydrocuprite*, Lebanon, Pa.; Limonite from Serpentine, Ferruginous Quartz from Serpentine, near Newtown Square, Del. Co., Pa.

W. W. Jeffries. Serpentine with Marmolite, Brinton's Quarry, Chester Co., Pa.

W. L. Mactier. Anthracite Nodules, Luzerne Co., Pa.

Dr. Isaac Lea. Allanite and Zircon, Yellow Springs, Chester Co., Pa.

Jos. Willcox. Limonite altered from Serpentine, Middletown, Del. Co., Pa.

E. S. Reinhold. Copiapite, Mahanoy City, Pa.

Mrs. M. A. Haldeman Catlinite, Head of Pipestone Creek, S. W. Minn.

Wm. S. Vaux. Fine specimens of crystals of Calcite, of Analcime, Datholite and Calcite, Bergen Hill, N. J.; Crocoite and Pyromorphite, Wheatley Mine, Phœnixville, Pa.; Prehnite with Datholite and Pyrite, Bergen Hill, N. J.; Rubellite and Lepidolite in quartz, Mt. Mica, Me.; Gypsum, Monte Doneto, Bologna, Italy; Idocrase, Monte Somma, Vesuvius; Crystals of native sulphur, Girgenti, Sicily.

Mrs. S. L. Oberholtzer. Graphite (3 specimens), Chester Springs, Chester Co., Pa.

E P. Oberholtzer. Magnetite (8 specimens), Warwick, Chester Co., Pa.

Vickers Oberholtzer. Hematite, Pikeland Mine, Chester Co., Pa.

Jos. Jeanes. Meteoric iron, Cohahuila, Mexico; Glaucodot, Tunaberg, Sweden; Nephrite (Jade), Torrent de Arnotte, Alibert, Siberia; Large crystal

[1] Minerals new to the collection in *italics*.

of quartz, Mt. St. Gothard, Switzerland; Chiastolite, Lancaster, Mass.; Allanite, Edenville, N. Y.; Pyromorphite, Ems, Nassau, Germany; Scheelite and Fluorite, Fürstenberg, Saxony; *Ærinite*, Arragon, Spain; *Walchowite* Walchow, Moravia; Lignite, Redwitz, Bavaria; Lignite, Germany; Lignite with Retinite, Grimma, Saxony; *Bast Coal*, Wettersau, Rhein-Pfalz; Obsidian (2 specimens), New Zealand and Island of Lipari, Medt.; Wood Opal (2 specimens), Nevada Co., Cal.; Tourmaline, near Lebanon, N. H.; Pyroxene (2 specimens), De Kalb, St. Lawrence Co., N. Y.; Chlorite, pseud. after Garnet, Spurr Mt. Mine, Mich.; Calcite incrustation, Clermont, France; Scapolite, Bob Lake, Canada.

J. M. Hartman. Native gold in quartz, Venezuela; Native gold in quartz, Arizona; Native gold in quartz, N. C.; Native silver in quartz (3 specimens), Mexico; Native capillary silver in quartz. Mexico; Crystallized copper, Lake Superior, Mich.; Ore Knob copper, N. C.; Dendritic copper, N. C.; Diopside, Garnet and Chlorite, Piedment, Ala.; Coccolite, Amity, N. Y.; Seybertite, Amity. N. Y.; Epidote, Tyrol; Emerald, Bogota; Labradorite, Labrador; Rutile, Macon Co., Ga.; Orthoclase (Amazon Stone), El Paso, Col.; Calcite, Guanajusto, Mexico; Calcite, Mineral Point, Wis.; Calcite, Lake Superior, Mich.; Calcite, loc.?; Sulphur, Lake Co., Cal.; Sulphur, Cal.; Graphite, Ceylon; Graphite, Ticonderoga, N. Y.; Graphite, Brockville, Canada; Sphalerite (Cleiophane), 3 specimens, Franklin, N. J.; Galenite, Japan; Galenite, Mine La Motte, Missouri; Cinnabar, Guadaloupe, Cal.; Wulfenite, Germany?; Wulfenite, Nevada; Heliotrope, India; Calcite, Rossie, N. Y.; Calcite and Copper, Lake Sup, Mich.; Amethyst, coated with Pyrite, Lake Sup., Mich.; Calamine (2 specimens), Franklin, N. J.; Halite (2 specimens), Colorado River, Arizona; Byssolite, Chester Co., Pa.; Ripidolite, Chester Co., Pa.; Moss Agate. Colorado; Nine polished Agates, Paraguay; Six crystals of Spinel, Amity, N. Y.; Limonite (2 specimens), Durham, Pa.; Limonite, Fox Hill, Shenandoah, Va.; Limonite shale, near Fogelsville, Pa.; Limonite (Kidney ore), Lake Superior, Mich.; Limonite, (5 specimens), from Negaunee, Mich.; Brown Tourmaline, Gouverneur, N. Y.; Apophyllite crystal, Bergen Hill, N. J.; Quartz, Japan; Quartz, Lancaster Co., Pa.; Smoky Quartz, El Paso, Col.; Quartz and Specular Hematite, Keswick, England; Yellow Quartz, Sardonyx, Chalcedony, Chalcedony artificially colored, Alps; Fluorite, Arizona; Hematite, Saxony; Hematite, England; Specular Hematite, Elba; Specular Hematite and Quartz, Elba; Ditto., Antwerp, N. Y.; Ditto. (Slickensides), Byram Mine, N. J.; Ditto., ditto., Negaunee, Mich.; Hematite Geode, Col.; Geodes of Calcite in Hematite, Rockwood, Tenn.; Hematite, pseud. of Calamite, Shawnee, Ohio; Hematite, Iron Mt., Mo.; Lenticular Hematite, Frankstown, Pa.; Micaceous Hematite, from Dillsburg, Pa., Rossie, N. Y., Negaunee. Mich, and Va.; Millerite in Hematite, Antwerp, N. Y.; Göthite, Pike's Peak, Col.; Actinolite, Sweden; Fahlunite in Talc, Fahlun, Sweden; Analcite and Mesotype, Nova Scotia; Natrolite, Bergen Hill, N. J.; Azurite, Cornwall, Pa; Talc, Fowler, N. Y.; Allanite, Sweden; Hornblende, Bohemia; Cassiterite, Australia; Galenite from Colorado, Utah, Arizona, and Sweden; Pyrite, Amboy, N. J., Roxbury, Conn.; Chalcopyrite, Rossie, N. Y., and Nevada Co., Cal.; Zincite and Franklinite, Franklin, N. J.; Zincite and Willemite, Franklin, N. J.; Zincite Foliated, Franklin, N. J.; Sapphire, Sparta, N. J.; Corundum, Ala.; Ilmenite, Amity, N. Y.; Magnetite from Durham, Pa., Lake Superior, Colorado and Mexico; Wood Agate, Col.; Augite and Calcite, Amity, N. Y.; Tremolite var. (Hexagonite), St. Lawrence Co., N. Y.; Mountain Leather, Sweden; Pargasite, N. Y.; Rœpperite, Franklin, N. J.; Willemite and Franklinite, Franklin, N. J; Garnets from Sweden, N. J., and Pa.; Tourmaline in Calcite, Sweden; Sphene, Pectolite, N. J.; Sepiolite, Chester Co., Pa.; Williamsite, Chester, Pa.; Kaolinite, Japan; Wavellite, Ark.; Barite from French Broad, N. C., De Kalb Co., Ga., Missouri, and Saxony; Fibrous Gypsum, Col.; Calcite, Sweden; Siderite,

Conn.; Aragonite, Col., and Mo.; Malachite, Japan; Chalcocite, pseud. after Wood, Texas; Manganite, Lake Superior, Mich.; Serpentine (Marmolite), Bergen Hill, N. J.; Tephroite, Willemite and Franklinite, Franklin, N. J.; *Ludwigite*, Moravicza, Bannat, Siederite in Quartz, Greenland; Obsidian (Pele's Hair) (artificial), Durham, Pa.; Orpiment (artificial), Galenite, Mine La Motte, Mo., and from Illinois; Chalcopyrite, Japan; Marcasite, Mine La Motte, Mo.; Cuprite, New Mexico; Menaccanite (Iserine), Bohemia; *Minium* (artificial), Sala, Sweden; Pyrolusite, Franklin, N. J.; Opal, San Diego, Cal.; Sahlite, Sala, Sweden; Pseud. of Chlorite after Garnet, Mich.; Phlogopite, Sterling, N. J., and Amity, N. Y.; Orthoclase (Lennilite) Lenni, Del. Co., Pa.; Tourmaline in Muscovite, Paris, Me.; Chlorastrolite, Lake Superior; Stilbite, Nova Scotia: Serpentine and Chrysolite, Westville, N. J.; Kaolinite, N. J.; Jefferisite, Chester Co., Pa.; Margarite, Chester, Mass.; *Durangite*, Durango, Mexico; Anglesite and Galenite, Arizona; Calcite (Spartaite), Sparta, N. J; Oölite, Utah; Calcareous Tufa, Japan; Dolomite on Quartz, Mexico; Bituminous Calcite, Sweden; Smithsonite, Mineral Point, Wis.; Strontianite, Georgia; Cerussite, Mexico; Hydromagnesite on Serpentine, Hoboken, N. J.; Azurite, Nevada; Willemite (Troöstite), Franklin, N. J.; Gieseckite, Diana, N. Y.; Stalactite (Chalcedony), Florissante, Col.; Agalmatolite, Serpentine, Rossie, N. Y.

In exchange. Dyscrasite, Hartz Mts.; *Clausthalite*, Tilkesode, Hartz; *Alabandite*, Hagyag, Transylvania; *Breithauptite*, Andreasberg, Hartz; *Arite*, Pyrenees; Embolite, Silver City, N. Mexico; *Jacobsite*, Jacobsberg, Sweden; *Fulgurites*, Thompson, Carroll Co., Ill.; Amphibole (*Edenite*), Edenville, N. Y.; *Arfvedsonite*, Greenland; *Forsterite* (Boltonite), Bolton, Mass.; *Gehlenite*, Mt. Monzoni; *Keilhauite*, Snarum, Sweden; *Catapleiite* and Astrophyllite, Norway; *Faujasite*, Baden; *Antillite*, Cuba; *Sipylite*, Amherst Co., Va; *Diabantite*, Bergen Hill, N J.; *Chalcosiderite*, Cornwall, England; *Arseniosiderite*, France; *Borikite*, Bohemia; *Bindheimite* (Bleinierite), England; *Howlite* from Gypsum, Hants, N. S.; *Warwickite*, Edenville, N. Y.; *Hübnerite*, Mammoth District, Nevada; *Cuproscheelite*, La Paz, Cal.; *Cyanotrichite*, Cape Garonne, France; *Dawsonite*, Montreal, Canada; *Schraufite*, Germany; Natrolite and three specimens of Apophyllite, Bergen Hill, N. J.; White Garnet, Hull, Quebec, Canada.

Rocks.—Dr. H. C. Eckstein. Coal, with associated rocks, Green Harbor, Spitzbergen; Fossiliferous rock, Concretion Quartz, Green Harbor, Spitzbergen; Quartz, Mica-schist and Gneiss, Hammerfest, Norway.

E. S. Reinhold. Diorite (Napoleonite), American River, Cal.

Theo. D. Rand. Steatite with cavities formerly containing pseudomorphs of Serpentine after Staurolite, near Merion Square, Montgomery Co., Pa.; four lead casts of pseudomorphs of Serpentine after Staurolite; seven Rock specimens from neighborhood of Philadelphia; Actinolite, Wissahickon Creek, Phila; Actinolite decomposing, Wissahickon Creek, Phila.

Dr. Jos. Leidy. Twelve specimens showing natural jointed fracture, from the Potsdam Sandstone, South Mountain, near Wernerville, Bucks Co., Pa.; Black Hornstone pebble, with rhombs of Calcite, from the Delaware shore, Easton, Pa.; Granitoid pebbles, Quartz and Mica, from the gravel on the Almshouse ground, Phila.; Pebbles of Quartzite, from the gravel, Phila.; Pebble simulating a stone hammer, from the gravel of the University ground, W. Phila.; Probable Coprolite, Phosphate beds of Ashley River, S. C.

Dr. W. N. Whitney. Lava, Japan.

A. H. Smith. Rhomboidal pebble, from the gravel near Tinicum, Delaware Co., Pa.

A. Kollner. Ringing rock, Del. Narrows, Bucks Co., Pa.; Rock containing Garnets, Bryn Mawr, Pa.

W. H. Harned. Calcareous Tufa with imbedded leaves, near Natural Bridge, Va.

J. M. Hartman. Serpentine and Chrysolite, Westville, N. J.; Serpentine, Del. Co, Pa.; Unakyte, French Broad, N. C.; Tremolite, Chile; Calcareous nodule.

ADDITIONS TO THE LIBRARY.

December 6, 1881, to December 26, 1882.

Abbot, H. Experiments and investigations to develop a system of submarine mines for defending the harbors of the United States. Engineer Corps, U. S. A.
Abbott, C. C. Primitive industry. The Author.
Allison, L. C. Discovery of Tripoli near St. John. The Author.
Angelin, N. P. Geologisk Öfversigts-Karta öfver Skäne. F. V. Hayden.
Balfour, F. M. Treatise on comparative embryology. II. Jos. Jeanes.
Baillon, M. H. Dictionaire de Botanique, 14me Fasc. I. V. Williamson Fund.
Natural history of plants. I. V. Williamson Fund.
Ball, V. Manual of the Geology of India. III. Economic Geology. Geological Survey of India.
Baltzer, A. Beiträge zur geologischen Karte der Schweiz, 20e Lief. Die mechanische Contact von Gneiss und Kalk im Berner-Oberland. With Atlas, 1880. F. V. Hayden.
Baraga, R. R., Bishop. A dictionary of the Otchipwe language, explained in English. II. Otchipwe-English. F. V. Hayden.
Barber, E. A. Pueblo pottery.
Antiquity of the tobacco-pipe in Europe. Pt. 2.
Catalogue of the collection of tobacco-pipes.
Mound pipes. The Author.
Barrande, J. Defense des Colonies. V.
Du maintien de la nomenclature établie par M. Murchison.
Acéphalés. Études locales et comparatives. The Author.
Bauerman, H. Text-book of systematic mineralogy, 1881. The Author.
Berg, Carlos. Contribuciones al estudio de las Cicadidæ de la Republica Argentina y paises limitrofes.
Sinonimia y descripcion de algunos hemipteros de Chile del Brasil y de Bolivia.
Farago lepidopterologica. The Author.
Bertrand, E. Note sur l'andalousite du Bresil.
De l'application du microscope à l'étude de la minéralogie.
Propriétés optiques de la Brochantite.
Sur les differences entre les propriétés optiques de corps crystallidés birefringents et celles que peuvent présenter les corps monorefringents.
Propriétés optiques de la Beudantite et de la pharmacosidérite.
Sur les cristaux pseudo-cubiques.
Étude optique des différents mineraux.
De l'application du microscope à l'étude de la minéralogie.
Sur les propriétés optiques des corps cristallises presentant la forme spherolithique.
Sur la leadhillite de Matlock. G. Vaux.
Bibliographie geologique et paléontologique de l'Italie, 1881. F. V. Hayden.
Bjorling, E. G. Fonctions elliptiques. The Westeräs Gymnasium.
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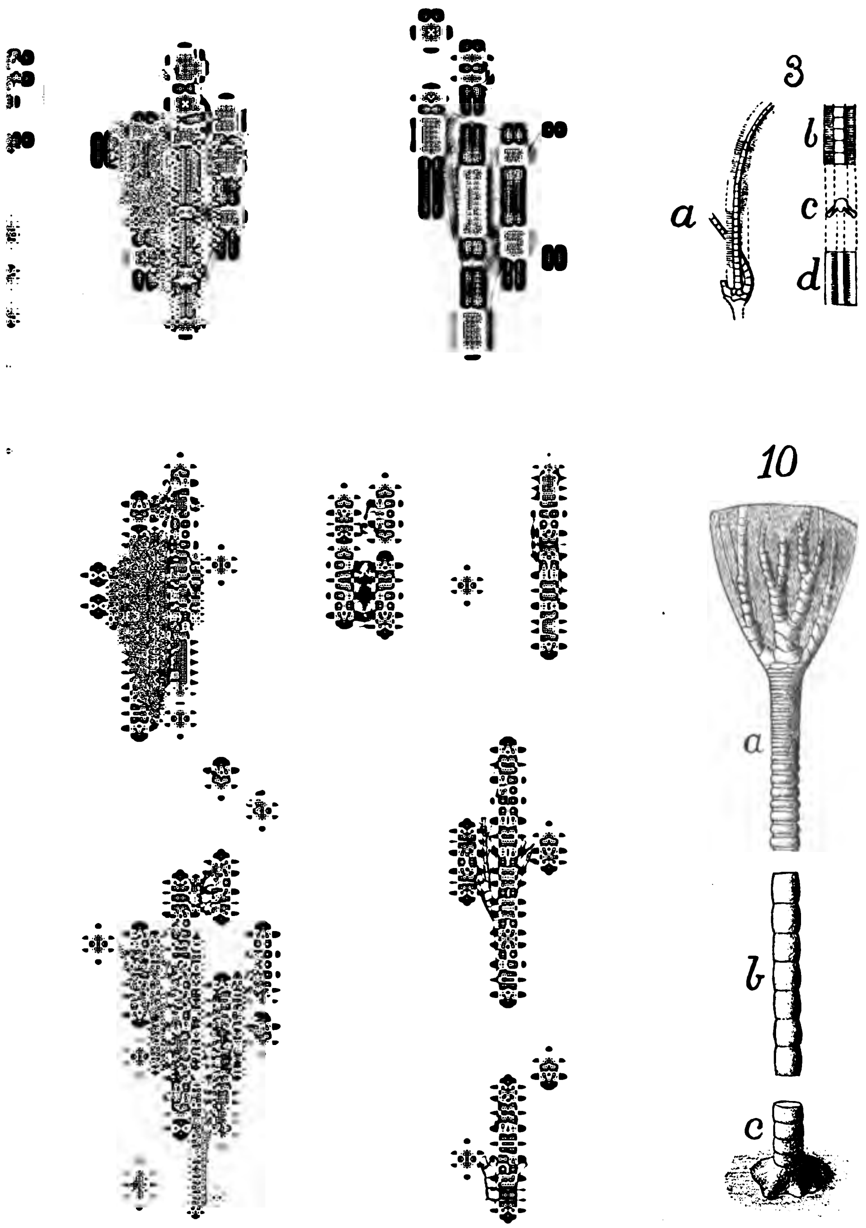
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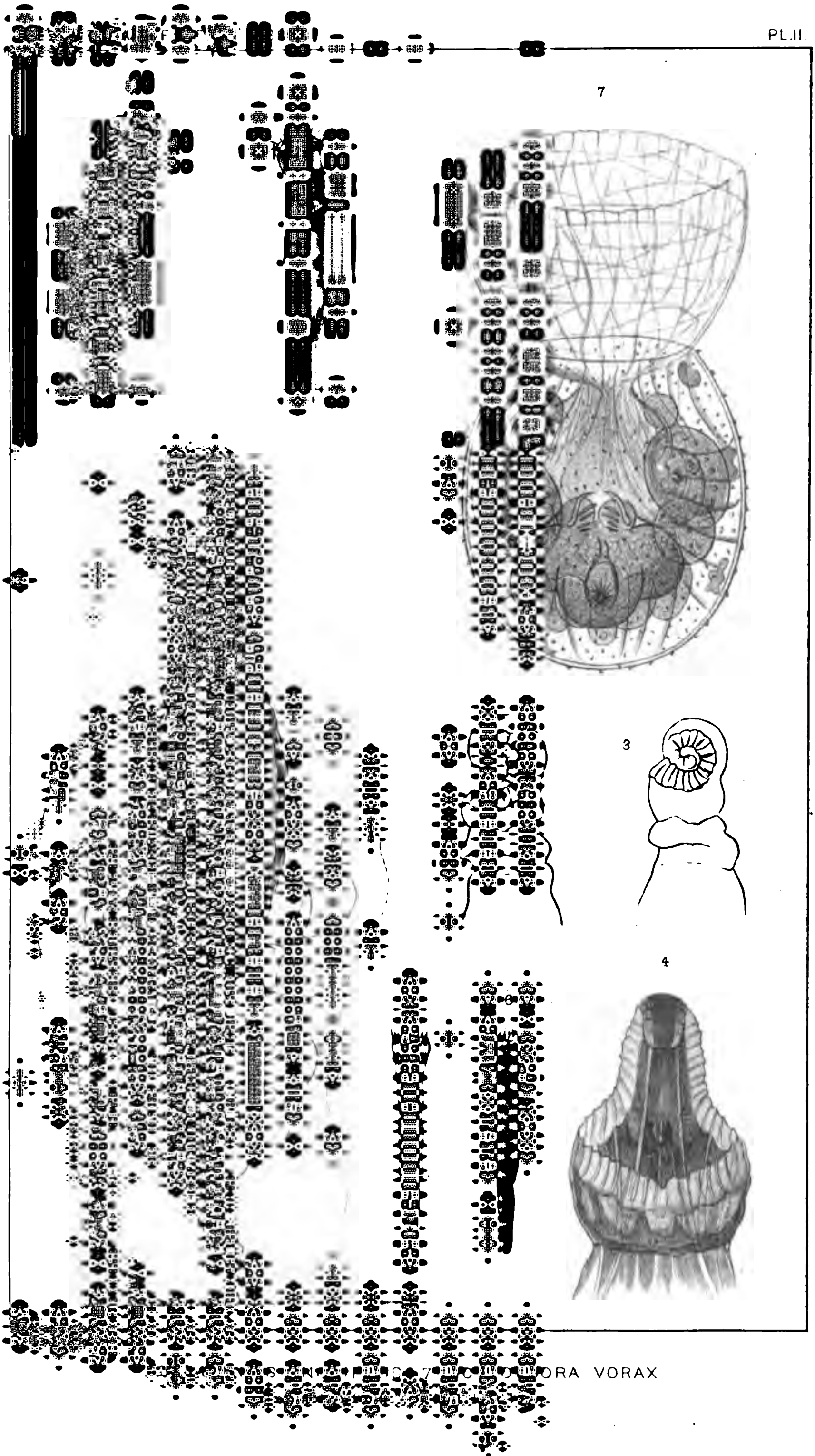

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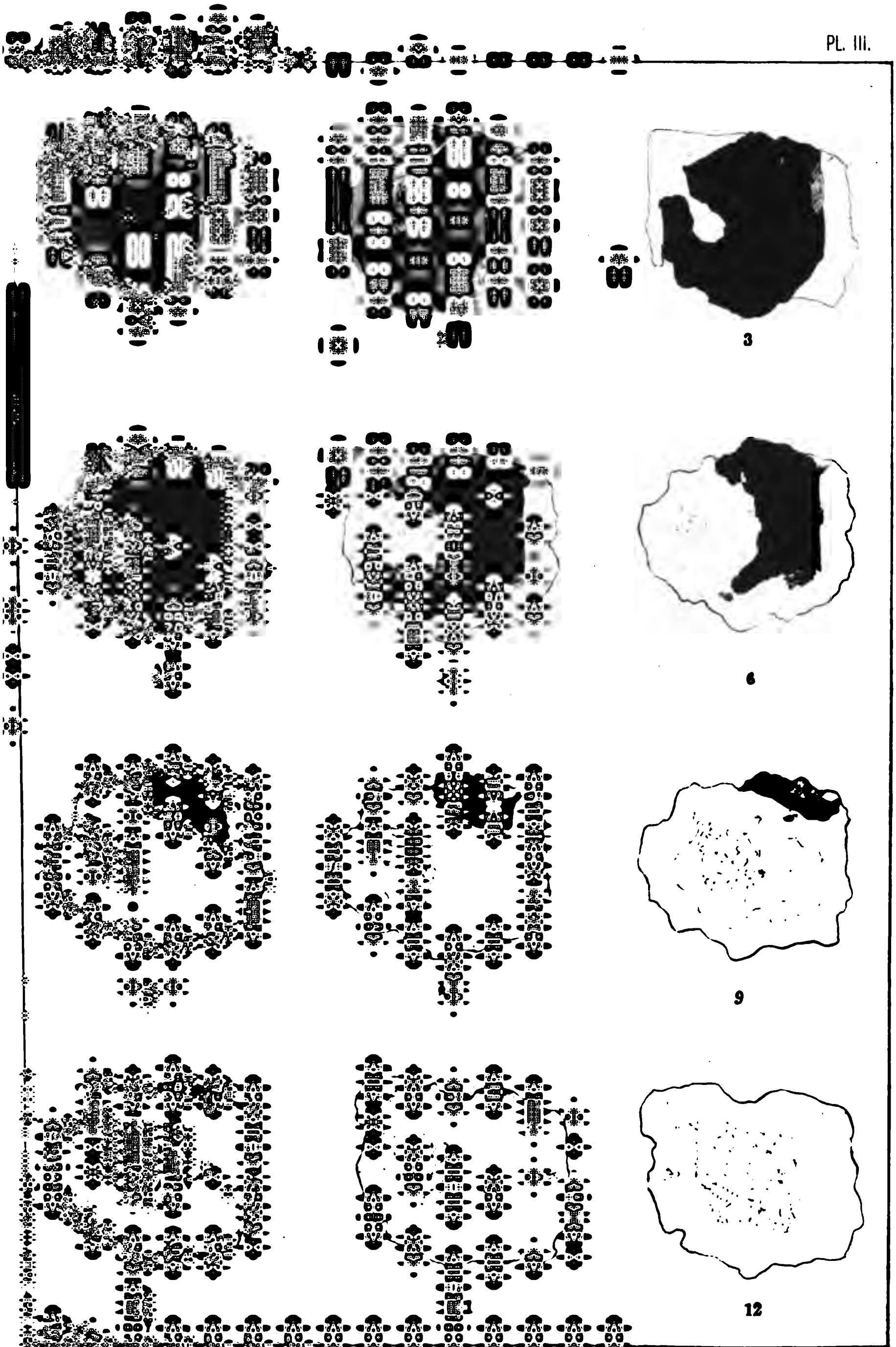

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